LISBON SCHOOL OF ECONOMICS & MANAGEMENT
UNIVERSIDADE DE LISBOA

MASTER
MONETARY AND FINANCIAL ECONOMICS

MASTER'S FINAL WORK
DISSERTATION

SECULAR STAGNATION: IS IMMIGRATION PART OF THE SOLUTION?

SANDRO MIGUEL DA SILVA MORGADO

SEPTEMBER - 2021

LISBON SCHOOL OF ECONOMICS & MANAGEMENT
UNIVERSIDADE DE LISBOA

MASTER
MONETARY AND FINANCIAL ECONOMICS

MASTER'S FINAL WORK
DISSERTATION

SECULAR STAGNATION: IS IMMIGRATION PART OF THE SOLUTION?

SANDRO MIGUEL DA SILVA MORGADO

SUPERVISION:
JOSÉ ALVES

SEPTEMBER - 2021

Acknowledgments

First and foremost, I would like to thank Professor José Alves for all the guidance, supervision, commitment and unexceeding availability. His inputs and knowledge are the real reason this paper is (hopefully) a proper master thesis rather than the mere ramblings of a layman.

I would like to thank my mom and my sister, without whom I wouldn't be here able to present a master thesis. Thanks for all the sacrifices and unwavering love you have dedicated me.

To Joana, for all the support, comprehension and patience. For being a mom and a dad when I was playing student. For all the love I am yet to repay. This is much mine as it is yours!

Lastly but most importantly, I want to apologise to my kid, Salvador. For all the times you asked dad to come play and I couldn't. For all the park walks I stayed at home. For all the little thigs I lashed out because I was too self-absorbed. For all the attention you craved, and I had to study…I am sorry and I vow to make it up for you!

Abstract

In 2013, Summers (2015) revived the secular stagnation hypothesis, firstly postulated by Hansen (1939), to describe the current macroeconomic picture faced by developed economies. This dissertation assesses this claim. Taking into consideration the inputs from several authors, we elaborate on a workable definition of secular stagnation erected on four pillars: diminished long run growth potential, increasing aggregate demand shortages, lowering of nominal short term interest rates and increasingly immovable unemployment. This four-pillar definition reveals a fundamental problematic faced by these economies; while a diminished long run growth potential, increasing aggregate demand shortages and an increasingly immovable unemployment stress the need for full employment policy measures, the lowering of nominal short term interest rates makes the mostly resorted to full employment policy measure, in the form of expansionary monetary policy, ineffective. This problematic implies an imperative rethinking of the policy framework in times of secular stagnation. For this rethinking, we consider one of the most evoked factors causing secular stagnation, demographics in the form of an aging population and a declining working age population, hence highlighting the pertinence of immigration as a possible solution. We do so by empirically observing the pillars of secular stagnation and testing the impact of demographic factors on those features, setting four linear regressions in which each of those pillars are set as the explained variables and demographic factors set as explaining variables. We then test the impact of these demographic factors resorting to panel data analysis. Focusing on the EU15 and US economies, with data ranging from 1965 to 2020, we conclude that the four pillars we based our definition of secular stagnation upon can be empirically observed and that demographic factors play a statistically significant role for those determining features thus highlighting the pertinence of immigration as a possible solution.

KEYWORDS: Economic stagnation; secular stagnation; financial crisis; immigration; monetary policy.

JEL CODES: E52; G01; J11; O47

Table of Contents

1. INTRODUCTION

Financial crises and migration crises were among the top concerns of developed countries in pre-COVID19 world. On the one hand, the financial crisis of 2007/2008 brought into question the distortions introduced by the growing relevance of finance in economic activity and the merits of capitalism as the best societal way of organizing itself. On the other hand, the massive migration flows from Africa and the Middle East to Europe, as well as from South America to North America, put into question the core values and ideals of liberal democracies. The abandonment of the idea of multilateralism, globalism, cosmopolitanism in favour of unilateralism, nationalism, obscurantism, respectively, as well as the rise of racism and xenophobia trends. They all seem to have been fuelled by the financial and migration crises that plagued the developed world in the dawn of the new millennium. These financial and migration crises may not be dissociated from the macroeconomic environment from which they flourish.

Secular stagnation is neither a new nor a unanimous concept among economists. Since the first time it was called upon describing a macroeconomic outlook by Hansen (1939), this concept has been met with acceptance, scepticism, criticism, irrelevance, and revivalism. On its inception, secular stagnation was closely associated with the notion of economic maturity. The general idea being that since population growth stagnated and new investment opportunities ceased, economic activity would reach a stationary state corresponding to a situation of stagnation. Subjacent to this perspective lied the assertion that investment grows through capital widening and/or capital deepening, with the first occurring via increasing demand and the second via new technologies or ways of producing. Given a situation of a stagnated population growth (meaning stagnated demand) and a cessation of new investment opportunities (meaning a stagnation in new technologies or ways of producing), net investment stagnates, and the economy enters secular stagnation, Backhouse and Boianovsky (2016). By 1950 it became well established that the US was a mature economy but given the levels of prosperity witnessed at the time, the association between economic maturity and stagnation was lost and the concept of secular stagnation fell into oblivion. But does this mean Hansen (1939) was wrong and secular stagnation was nothing more than the projection of some economists' hypochondria? Certainly not. It only means that the assumptions upon which Alvin Hansen had based his analysis were drastically changed afterwards. As a matter of fact,

the fundamental premise upon which Alvin Hansen had based his prediction for secular stagnation was shattered, as the post-war baby boom in the US resolved the underlying question of a stagnant population growth. And before the baby boomers entered the labour force, a period of outstanding public expenditure supported economic growth.

Given the controversy surrounding such topic, this thesis adopts a definition of secular stagnation that encompasses the different views of some of the most renowned economists to have shared a thought on the subject, the definition provided by Teulings and Baldwin (2014). According to this, secular stagnation is defined as an economic state characterized by weak and anaemic recovery/expansion cycles and by self-feeding depressions, where sluggish economic growth emanates from the combination of a diminished long-run growth potential with persistent shortages of aggregate demand, resulting in a recurrent immovable unemployment that feeds further decreases in potential output and aggregate demand, setting a vicious cycle that pour into economic stagnation. This vicious cycle results from factors that simultaneously make monetary policy ineffective, as nominal interest rates are binding at zero – the zero lower bond problem. From the above, we define secular stagnation as the result of four fundamental features – diminished long-run growth potential measured by potential GDP per capita, increasing aggregate demand shortages measured by the differential between GDP per capita and potential GDP per capita, one-off supply-side damage in the form of immovable unemployment fed by an off job skills depreciation and low and sticky nominal short term interest rates that make expansionary monetary policy ineffective (the zero lower bond problem).

But how does the concept of secular stagnation relate to those of financial and migrations crises, as previously allured? Right from its inception, the notion of secular stagnation has been umbilically linked to that of a stagnant population, not being a coincidence that the first time the term was called upon describing an economic outlook was in 1938 Alvin Hansen's presidential address speech rightly entitled “Economic Progress and Declining Population Growth”, Hansen (1939). This seminal association is not contradicted, by the contrary is accepted and assimilated, in the revivalism of the secular stagnation concept, where a declining population growth constitutes a fundamental headwind that, among others, impedes a natural process of economic growth. This impediment means that more and more economic growth in developed

economies must be leveraged on credit, leading to credit dependent economies that become more prone and susceptible to financial crises.

The provided definition of secular stagnation holds a paradox that constitutes a fundamental problematic faced today by developed economies. On the one hand, because these economies are facing secular stagnation, they are experiencing a diminished long run growth potential, increasing aggregate demand shortages and recurrent immovable unemployment that emphasize the need for full-employment policy measures. On the other hand, exactly because developed economies are facing secular stagnation, the mostly resorted to full-employment policy measure, in the form of expansionary monetary policy, is ineffective given the zero lower bound problem. This paradox calls for an imperative rethinking of the policy framework in times of secular stagnation.

This thesis proposes to explore the different facets of this problematic. In doing so, it will assess and verify the four fundamental features from which secular stagnation arises in developed economies. Afterwards, it will deepen the linkage between secular stagnation and the ineffectiveness of monetary policy as well as its potential for financial crises. Finally, in a context of secular stagnation where monetary policy may be ineffective and unsustainable, this thesis suggests a new approach in terms of policy framework, one that focus on its fundamentals - for this we focus on demographics as a particularly transversal and impactful one, thus underlining the pertinence of immigration as a plausible policy response.

Accordingly, our thesis is structured as follows. Section two reviews the relevant literature on the subject, focusing on the secular stagnation discussion. Section three describes the data and methodology employed in our analysis. Section four provides the main findings of our research regarding the verification of the four features of secular stagnation and the causality of demographic factors for those features. Section five presents the conclusions of this empirical research.

2. LITERATURE REVIEW

The revivalism of secular stagnation happened by the voice of Lawrence H. Summers at his 2013 IMF speech. Summers (2015) launched the secular stagnation hypothesis as the impossibility for developed economies to reach full-employment levels resorting to the "old monetary trickery" of lowering interest rates, due to what he perceived to be negative natural interest rates faced by such economies. Summers (2014) reaffirms the secular stagnation hypothesis as the impossibility to attain a full employment real interest rate (FERIR), introducing the zero lower bond problem as the result of nominal interest rates that are binding at zero, low inflation and unemployment. Two fundamental factors explain the lowering of the interest rates: a decrease in investment demand driven by slower population growth and by a technological progress that is less needy of physical capital, and a decrease in consumption driven by an increasing inequality that implies an income transfer from high propensity to consume agents to low propensity to consume ones. This demand side perspective is deepened in Summers (2015) where the author, admitting the need to rethink the macroeconomic policy framework in times of secular stagnation, dismisses structural reforms as a viable solution due to secular stagnation deriving not from the supply but from the demand side. Instead, an effective full employment policy framework in times of secular stagnation should involve expansionary fiscal policy. Summers (2016) emphasizes expansionary fiscal policy as the answer in times of secular stagnation by disregarding unconventional monetary policy for such effect. Another relevant aspect introduced by Summers (2014) regards the association of low interest rates and expansionary monetary policy with financial instability.

Upon this revivalism of the secular stagnation hypothesis, Probst (2019) corroborates Summers' idea by underlining four fundamental causes and three main consequences of secular stagnation. According to him, a declining productivity growth, the falling price of investment goods and the growing digital economy, aging societies and increasing monopolization constitute the fundamental factors behind secular stagnation. The global decline in real interest rates, the increase in asset prices and private sector debt and rising inequality its consequences. Krugman (2014) admitted annoyance towards Summers reviving the secular stagnation hypothesis given that he himself "had been groping toward more or less the same idea and had blogged in that general

direction", Krugman (2014). By observing data on the real interest rates for the US from 1980 to 2012, the author concludes about a downward trend in real interest rates, agreeing with Summers about the pivotal relevance of the zero lower bound problem for the current macroeconomic situation in developed economies. Krugman (2014) also hints about the linkage between secular stagnation (and a context of low interest rates) and financial crises, noticing the rise in leverage that preceded the financial crisis of 2007/2008, when household debt rose from 67% of GDP in 2001 to 94% in 2007, for the US economy. Finally, by looking at data regarding the rate of growth of the working-age population for the Eurozone for the 2006-2012 period, Krugman (2014) highlights this demographic feature as a particularly worrisome for the current macroeconomic picture among developed economies, indicating these values entered negative territory for the Eurozone and significantly dropped in the US.

As put by Summers and corroborated by Krugman, the lowering of interest rates and consequent zero lower bound problem constitute a fundamental feature of secular stagnation. By observing the short and long-term global real interest rates from 1985 to 2012 for nineteen developed economies, Blanchard et al. (2014) seem to arrive at the same conclusion. According to these authors, the lowering of real interest rates is bad for monetary policy but good for fiscal policy, highlighting the pertinence of expansionary fiscal policy in a context of secular stagnation. Caballero and Farhi (2014) flow in the same direction by setting a simple model to analyse the demand and supply of safe assets. Through their analysis, they argue there is a shortage of safe assets that is behind the lowering of interest rates observed by the evolution of the three-month real interest rate and the ten-year real interest rate for the US economy from 1990 to 2012. These authors end up adverting that "low interest rate environments are known to be prone to speculative episodes and the emergence of financial bubbles", Caballero and Farhi (2014).

But as previously mentioned, the concept of secular stagnation is not unanimous among scholars and even those who agree to the secular stagnation hypothesis might disagree on its very nature. That is the case of Gordon (2014) who puts the onus of such stagnation on the supply side of the production function. Gordon (2014) defines four major headwinds causing a diminished long run growth potential: demographics, education, inequality and government debt. Because the onus of secular stagnation is put on the supply side, instead of defending measures envisioned to fight demand shocks such

as expansionary fiscal policy, Gordon (2014) finds the answer on structural reforms. Raising retirement age in line with life expectancy, raising immigration quotas, freeing non-violent offenders and adopting a new model for financing education constitute the policy measures suggested by Gordon to fight his supply side secular stagnation. Even though emphasizing supply side factors, it seems clear that some of these are transversal to the explanation of secular stagnation either from a supply side perspective or from a demand side one. An aging population is a factor for the decrease in labour participation and labour productivity as it is for a decrease in investment demand. And even those factors who seem to be originated from one side of the equation end up impacting on the other side of the production function. Inequality may be explained by the supply side behaviour of corporations but its impact is felt on the demand side via a decreasing consumption. Perhaps acknowledging this, Gordon (2015) ends up conceding that "in the end, secular stagnation is not about just demand or supply but also about the interaction between demand and supply", Gordon (2015). This conciliatory perspective seems to be shared by Blecker (2016), who enumerates both demand side and supply side factors to explain the secular stagnation trend inferred by its analysis on the average annual growth rates of US GDP for the last four business cycles.

Depending on if one views secular stagnation as demand sided or supply sided, the policy measures proposed in a context of secular stagnation vary. Resorting to a country-fixed effects panel data regression analysis, Buchner (2020) highlights the pertinence of expansionary fiscal policy in a context of secular stagnation. In an environment of persistent low interest rates, expansionary fiscal policy and sustainability of public finances no longer must be looked at as a trade-off. Traditionally, expansionary fiscal policy is regarded as a debt increasing tool for employment but in a scenario where GDP grows faster than debt, this macroeconomic paradigm changes. Wolff (2014), on the other hand, worries that little importance might be being given to the real factors causing secular stagnation. Even though recognizing there is a role for monetary policy and fiscal policy to play, the author reminds us that if the stagnation in developed economies is permanent, and not temporary, structural policies must necessarily be implemented.

But not everyone agrees to the secular stagnation hypothesis. A rationale of refusal that seems to have gathered a significant share of supporters regards the argument

involving technological progress, with the advocates of such rationale coming to be known as tech optimists. Eichengreen (2014) refutes both the demand side and supply side perspectives of secular stagnation by stating that, like in the past, new inventions, on fields like artificial intelligence or human genome, take time to produce their effect on productivity but as soon as they do, it will make no sense talking about a secular stagnation in productivity leading to a diminished long run growth potential. The author also discredits the aggregate demand perspective by stating that interest rates are not helplessly low given they are determined in international global savings market and in that market, there is no imbalance between the supply and the demand schedule of loanable funds. Eichengreen (2015) empirically corroborates this perspective by analysing data on the secular trend in global savings rate. This technological optimism is shared by Mokyr (2014) who, even though recognizing the negative impact of a declining working age population and inequality on economic growth, argues that the outstanding pace of today's technological progress in areas like computing, materials and genetic engineering will prove secular stagnation advocates wrong. Glaeser (2014) reminds us that in previous periods economic growth also showed sluggish patterns, but history ended up showing that it did not mean a permanent stagnation. According to him, two key factors for long term growth, namely innovation and investment, do not show any signs that might suggest a secular stagnation. Ramey (2020) analyses secular stagnation from a supply side perspective and according to her, two fundamental factors explain the slow growth in potential GDP: slow population growth and slow labour productivity growth. The author believes, though, that the great innovations of today will resolve the issue regarding the latter, noticing that great technological revolutions take their time to impact productivity, therefore we may not be facing secular stagnation but only a technological lull. Secular stagnation scepticism does not derive exclusively from a tech optimism perspective. Koo (2014) argues that developed economies are going through a balance sheet recession and not secular stagnation. According to him, as banks write off bad loans and people pay down their debt, a deleveraging process takes place, and it is this deleveraging that explains the anaemic recovery and sluggish economic growth evidenced by developed economies in the aftermath of the global financial crisis of 2007/2008.

Amidst such controversy, the urge to model the secular stagnation hypothesis was inevitable. Eggertsson and Mehrotra (2014) were the first responding that urge. They formalized the secular stagnation hypothesis by setting a simple overlapping generation (OLG) model where a slowdown in population growth, increasing inequality, and the tightening of limits on borrowing lead to a decrease in the equilibrium real interest rate. In this secular stagnation model, the return to positive steady-state values does not occur. Instead, a deleveraging shock accentuates the downward trend in the real interest rate that becomes permanently negative. Eggertsson et al. (2016) set an extension of the previous OLG model to assess the policy implications of secular stagnation in an open economy in the context of a textbook IS-MP model. Considering the case for an open economy (instead of a closed one) only reinforces the pertinence of fiscal policy in a context of secular stagnation. Eggertsson et al. (2019) set an OLG model to, qualitatively and quantitatively, evaluate the contributions of demographic and technological factors for the decline in interest rates since 1970, while at the same time quantifying changes required to attain higher rates. The main implication of the model is that permanently low interest rates can, indeed, lead to a situation of secular stagnation defined by a permanent output slump, the zero lower bound problem and below the target inflation. The changes required to attain higher interest rates imply non-consensual policy measures, such as higher inflation targets, persistent increases in debt-to-GDP ratios and more robust and "generous" social security schemes. The uncertainty about secular stagnation then poses a real challenge for policy makers as the policy recommendations in times of secular stagnation might be considered nefarious in normal times and policy measures of normal times ineffective and unsustainable within a context of secular stagnation. The aforementioned unsustainability derives from the financial instability that is associated with expansionary monetary policy in a context of secular stagnation. This association is deepened by Bresser-Pereira (2019) who argues capitalism has morphed itself from an entrepreneurial capitalism into a technobureaucratic capitalism, i.e., it passed from a productivity capitalism to a financier rentier capitalism, that will, in the end, lead to a higher propensity to financial instability.

Another aspect that seems transversal to the secular stagnation hypothesis lies on the demographic factor. On this subject, Acemoglu and Restrepo (2017) analyse all countries and OCDE countries reporting OLS and IV estimates from linear regressions.

The resulting estimates point to a positive and statistically significant correlation between an aging population and economic growth, contradicting the argument that places demographics as a fundamental factor for secular stagnation. In fact, this panel data analysis suggests that it is exactly countries where aging is more pronounced who have shown higher GDP per capita growth rates. Acemoglu and Restrepo (2017) argue that an explanation for these results resides on the fact that these aging economies feel more pressured to adopt new technologies, increasing technological progress and productivity. This explanation exacerbates the substitution effect between technology and labour in detriment of its complementary effect. Eggertsson et al. (2019), adopting the same methodology and the same data, arrive at entirely different conclusions under a variety of empirical specifications. In their study, AR empirical evidence supports the secular stagnation hypothesis rather than contradicting it, namely the association of a declining population growth as a fundamental factor. These authors state that Acemoglu and Restrepo (2017)'s conclusions are correct when applied to classical economies but when applied to secular stagnation economies that hit the zero lower bound, the sign of the correlation between aging population and GDP per capita inverts, passing from positive to negative. Ferrero et al. (2019) focus their analysis on the negative impact of demographics on the lowering of interest rates, presenting two theoretical arguments to explain this negative correlation. First, aging implies the need for more savings to spend in retirement leading to an increase in savings, i.e., the supply of loanable funds. Second, a declining working age population means that the physical capital left available by those who retire is more than enough for those who enter labour force, leaving no need for capital widening and thus inducing a decrease, or at least, a stagnation in investment demand. This argument exacerbates the complementary effect between labour and capital in detriment of its substitution effect.

From the reviewed literature, we retain three relevant aspects for our exposition. First, secular stagnation is not unanimously accepted as the macroeconomic reality faced today by developed economies. Second, in a context of secular stagnation the use of conventional monetary policy not only reveals itself ineffective given nominal interest rates that are binding at zero but also leads to financial instability. Third, demographics, in the form of an aging population and a declining working age population, seems to

negatively impact GDP per capita, potential GDP per capita and the interest rate, constituting in that way a fundamental and transversal factor for secular stagnation.

Even though the allusion to financial instability in a context of secular stagnation seems omnipresent in the reviewed literature, this association is predominantly derived from an environment of low interest rates, which constitutes only one feature of secular stagnation. Also, financial instability does not necessarily imply financial crises. This thesis though defends a stronger, deeper, endogenous like relation between secular stagnation and financial crises, one that is derived by Hyman Minsky's theory. According to this, during times of expansions, and as the memories of bad times fade, banks become more willing to grant loans, with reduced spreads, leading to businesses and households also more willing to contract new loans. This induces an increase in the levels of indebtedness in the economy. And as the cycle of expansion approaches full employment levels and inflationary pressures arise, monetary authorities are forced to intervene by raising interest rates. The increase in interest rates pressures highly indebted businesses and households as it aggravates their debt instalments-to-income ratios, eventually leading to some defaults. As banks are remembered of bad times, they panic and react to this panic by making big credit cuts (the Minsky moment). Some of these cuts affect revolving loans granted to businesses who need them to pay their suppliers and their workers. And as this liquidity flow stops, bankruptcies erupt, leading to a recessive spiral in which the bankruptcy in some businesses lead to the bankruptcy of others culminating in an increase in unemployment. The consequent decrease in income strangles the already pressured debt instalments-to-income ratios of businesses and households, further fostering delinquency rates and defaults. As a result of this, banks make new credit cuts reinitiating this vicious cycle as the economy plunges into a recession. After the economy enters a recession and deflationary pressures arise, monetary authorities then decrease nominal short-term interest rates, stimulating a new expansion cycle that reinitiates the whole process described by Minsky.

This dissertation argues that Hyman Minsky's explanation of financial crises is only valid because these economies are facing secular stagnation. A key aspect of this explanation consists of how the withdrawal of the monetary stimulus when facing inflationary pressures, by raising interest rates, leads to defaults that trigger the whole recessive spiral that characterizes these financial crises. This happens because the rise in

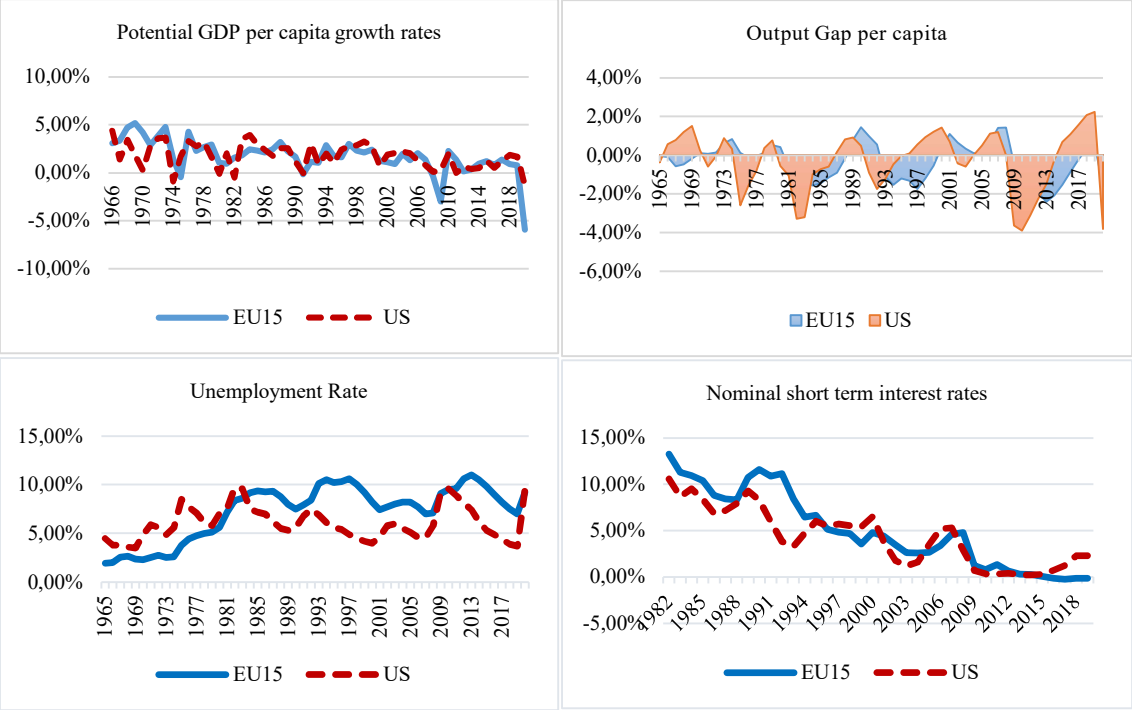
interest rates leads to an increase in the debt instalments of highly indebted entities deteriorating their debt-to-income ratios and consequently triggering the defaults that are at the root of such "Minskian" financial crises. This deterioration of the debt-to-income ratios only takes place because we are facing secular stagnation. Otherwise, and from a dynamic perspective, even after the withdrawal of the monetary stimulus, one should expect income to keep increasing which would imply the raising numerator in the debt-to-income ratio to be met by a compensating raising denominator, meaning no deterioration of the debt-to-income ratios and no defaults. This dynamic view is in fact at the core of the idea of monetary policy as a business cycle smoothing policy tool and is then valid if employed to deal with temporary shocks in the economy. But secular stagnation is no temporary shock, is a permanent long-lasting event. This means that when the monetary stimulus is withdrawn, instead of income keeping increasing it stagnates or decreases with the increasing interest rates and this happens because secular stagnation and its headwinds keep lingering in the economy. This stagnated or decreased income does not compensate the increasing debt instalments resulting from the withdraw of the monetary stimulus and consequent raise of interest rates, leading to the deterioration of debt-to-income ratios and consequent defaults that are at the root of financial crises. And that is why the repeated use of monetary policy within a context of secular stagnation is inducing of financial crises. Hence the linkage between financial crises and secular stagnation.

The unsustainability of monetary policy within a context of secular stagnation results, then, from the inadequacy of employing a policy measure conceived to deal with temporary shocks in a context of a long-lasting event. Given this unsustainability results from the above temporal inadequacy it would be theoretically incoherent from our part to agree with those who defend expansionary fiscal policy as the primordial response to the secular stagnation problematic, given such policy is too primarily conceived to deal with temporary shocks in the economy. So instead, this thesis considers that the rethinking of the policy framework in times of secular stagnation must necessarily involve structural policy measures that impact the factors causing the problem they intend to tackle. And if there is a transversal and fundamental factor causing secular stagnation, that is demographics, with a slow population growth and a declining working age population. And if there is a solution for such problem, immigration must be considered.

3. EMPIRICAL APPROACH

From the theoretical underpinnings previously laid, we defined secular stagnation as arising from four fundamental features: a diminished long run growth potential, increasing aggregate demand shortages, one-off supply side damage in the form of immovable unemployment and low and sticky interest rates that make monetary policy ineffective. The mere observation of data for the EU15 and US ranging from 1965 to 2020 (see figure 1) suggests that secular stagnation is indeed a reality among developed economies.

Figure 1 – Potential GDP per capita at constant prices, Output Gap per capita, Unemployment Rate and Short Nominal Interest Rates



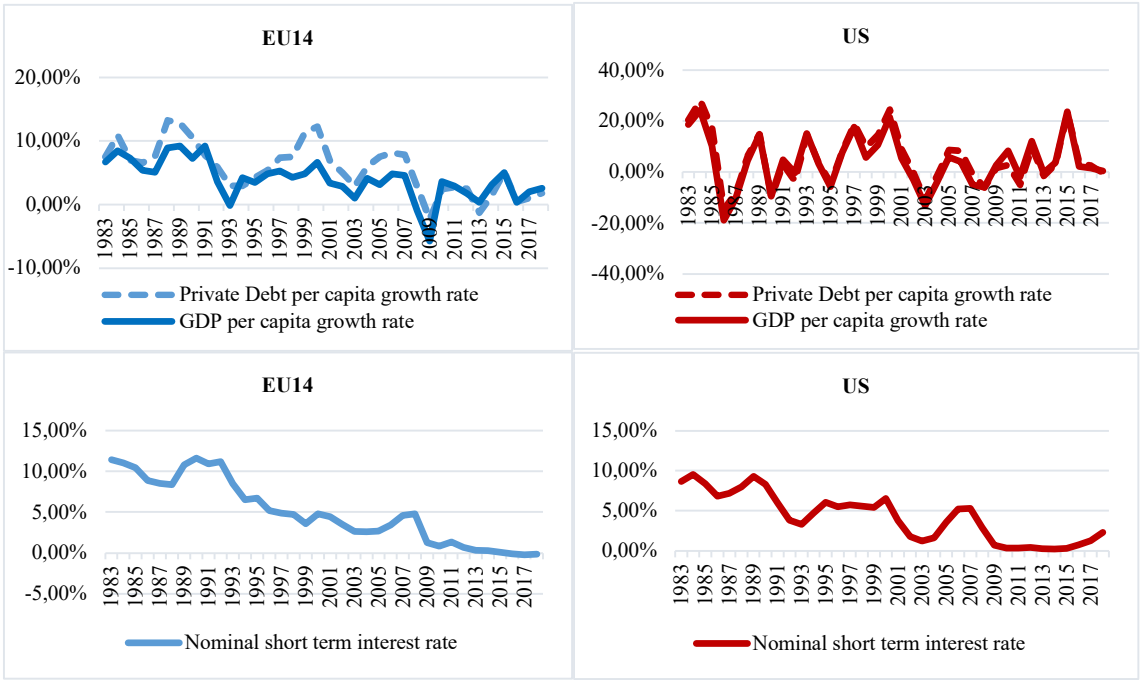
Source: AMECO. (2020-09-09). Potential GDP per capita growth rates were computed by the annual variation of the ratio of potential GDP over total population. Potential GDP series were based on potential gross domestic product at 2015 reference levels from AMECO (code: OVGDP); Total population series were based on total population from AMECO (code: NPTN). Output Gap per capita corresponds to the relative differential between GDP per capita and potential GDP per capita. GDP per capita series were based on gross domestic product at 2015 reference levels per head of population from AMECO (code: RVGDP). Unemployment rate series were based on unemployment rate from AMECO (code: ZUTN). Nominal short term interest rates series were based on nominal short term interest rates from AMECO (code: ISN)

The downward trend in potential GDP per capita growth rates suggests a diminished long run growth potential for these economies. And not only potential GDP per capita growth had diminished but actual GDP per capita growth decreased even more,

as suggested by the increasing negative output gaps given by the differential between GDP per capita and potential GDP per capita growth rates. The upward trend in the unemployment rate and the downward trend in the nominal short term interest rate complete the secular stagnation illustration for these economies.

A fundamental feature regarding secular stagnation concerns the zero lower bond problem, in which the lowering of nominal short term interest rates to near zero values makes monetary policy ineffective. We argued that not only monetary policy is ineffective but also its repeated use in a context of secular stagnation is inducing of financial crises. Figure 2 shows the perfect in synch symbiosis between economic growth and private debt for the EU14 (EU15 minus Luxembourg) and the US economies, revealing how economic growth has been highly leveraged on credit and thus highly susceptible to financial instability.

Figure 2 – Interest Rates, Private Debt and GDP per capita



Sources: AMECO (2020-09-09); IMF (2020-09-09); WDI (2020-09-09). Private debt per capita was computed by the ratio of private debt over total population. Private debt was computed by multiplying private debt as a percent of GDP for GDP. Private debt as percent of GDP series were based on the total stock of loans and debt securities issued by households and nonfinancial corporations as a share of GDP from IMF. GDP series were based on gross domestic product at current prices from AMECO (code: UVGD). Total population series were based on total population from WDI (code: SP.POP.TOTL). Nominal short term interest rates were based on nominal short term interest rates from AMECO (code: ISN).

A particularly revealing feature extracted from Figure 2 relates to how the interest rate, and its manipulation via monetary policy, connects to this synchronization. For the EU14, bottom values for the interest rate in 1988 and 1999 correspond to peak values for GDP per capita growth rates in 1989 and 2000, respectively; and peak values for the interest rate in 1992 and 2008 correspond to bottom values for the GDP per capita growth rates in 1993 and 2009, respectively. For the US economy though this relation does not seem as linear for the period considered, which seems to corroborate Jimeno et al. (2014)'s assertion that secular stagnation is more likely to be a European reality rather than an American one. In fact, excepting the year 1993, it was only since the global financial crises of 2007 that the US economy seemed to show the same pattern of the EU14 economies regarding bottoms in interest rates corresponding to peaks in GDP per capita growth rates and vice versa. Until then, peaks in the interest rates corresponded to peaks in GDP per capita growth rates, like in 1989 and 2000, and bottoms of interest rates corresponded to bottoms in GDP per capita growth rates, like in 1986 and 2003. This suggests that until 2007, for the US economy, it was the real economy that drove interest rates but since the global financial crisis this relation seems to have inverted, with the interest rates now driving the real economy. It is as if until 2007 an increasing consumption and investment demand would deem an increase in credit for those consumption and investment expenditures resulting in an increase in private debt per capita, GDP per capita but also in the interest rates due to the correspondent increase in demand for credit. But from 2007 on for the US economy, and since 1983, at least, for the EU14 economies, Figure 2 seems to suggest that the real economy is no longer able to push aggregate demand by itself, thus causing the need for it to be pushed and stimulated by monetary policy instead, with now peaks in GDP and private debt per capita growth rates corresponding to bottoms in the interest rate. It is no longer aggregate demand that determines the behaviour of interest rates but the behaviour of interest rates that determines aggregate demand. From these patterns, we claim that these empirically show the secular stagnation phenomenon. It is secular stagnation and its headwinds that prevent the real economy to push aggregate demand by itself, forcing the lowering of interest rates to achieve so. And as secular stagnation headwinds keep lingering in the economy, aggregate demand becomes gradually inelastic to negative variations in the interest rate implying increasingly bigger decreases to impact aggregate demand, with the

repeated use of expansionary monetary policy inevitably bringing nominal short term interest rates so low that they cannot be lowered any further, leading to the zero lower bond problem and deeming monetary policy ineffective. And that is why this dissertation claims the lowering of the interest rates, and the consequent ineffectiveness of monetary policy, to be endogenous to secular stagnation.

Beyond the endogeneity of the lowering of interest rates, we also claimed financial crises to be endogenous to secular stagnation. One critical aspect regarding this claim concerns the aggravating debt-to-income ratios when interest rates get raised. We told this happened because income ceased to increase when the monetary stimulus was withdrawn. Looking at figure 2, this seems to be true for the EU14 economies for the period considered and for the US from 2007 on.

The endogeneity of the zero lower bond problem and the endogeneity of financial crises within a context of secular stagnation are of the utmost importance for the secular stagnation discussion as it allows us to infer about the ineffectiveness and unsustainability of employing policy measures designed to deal with temporary shocks in a context of a long lasting event, thus permitting us to channel our proposition for the imperative rethinking of the policy framework in times of secular stagnation somewhere else, namely to structural policy measures that impact the factors causing this stagnation. Among these, the demographic factor gets ubiquitously evoked as a particularly transversal and impactful one, hence highlighting the pertinence of immigration as a potential policy measure.

The empirical work conducted obeys to this logical inference. Therefore, we empirically assess the four features of secular stagnation by analysing the contribution of the factors enumerated in literature review, focusing on the demographic factors presented as well as assessing the impact of net migration for those features. We do so by setting the following equations in a panel data framework.

Equation (1) assesses the first pillar of secular stagnation, namely the diminished long run growth potential measured by the variation of potential GDP per capita at constant prices. For that, we consider the neoclassical aggregate production function given by $Y = AF(K, L)$, where Y is the aggregate output, K is the capital stock (both human and physical), L is the labour force and A designates technological progress or productivity. Data regarding working age population represents L, net fixed capital

formation and the human capital index stand for physical and human capital respectively and total factors productivity for A. The variable regarding patent applications is pertinent from the perspective of the technological discussion presented in the literature review, where tech optimists argue the innovations of our days will solve the underlining question of slow growth and pessimists state that today's innovations do not impact productivity as others in the past did. Therefore, we set our Equation (1) as:

$$(1) \quad PotGDP_{i,t} = \beta_{0,i,t} + \gamma.WAP_{i,t} + \eta.HC_{i,t} + \delta.NFCF_{i,t} + \psi.PAT_{i,t} + \theta.TFP_{i,t} + \tau.NetMig_{i,t} + \eta_t + \nu_i + \varepsilon_{i,t}, t = 1, \dots, T;\ i = 1, \dots, N,$$

where *PotGDP* denotes the natural logarithm of potential GDP per capita at constant prices, *WAP* the working age population as the fraction of population aged between 15 and 64 on total population, *HC* the human capital index, *NFCF* net fixed capital formation per capita, *PAT* patent applications per one million of persons, *TFP* total factors productivity, and *NetMig* the net migration measured in hundreds of thousands.

Equation (2) empirically verifies the second pillar of secular stagnation in the form of increasing aggregate demand shortages, measured by the output gap per capita. From the reviewed literature, two fundamental factors are evoked when making the case for a demand-side secular stagnation: an aging population and inequality. Accounting for the inequality argument, we include the pre-tax Gini coefficient and regarding an aging population, we consider the dependency ratios as proposed by Ferrero et al. (2019).

$$(2) \quad GAP_{i,t} = \beta_{0,i,t} + \chi.Youngi,t + \phi.Old_{i,t} + \kappa.GINI_{i,t} + \tau.NetMig_{i,t} + \eta_t + \nu_i + \varepsilon_{i,t},\ t = 1, \dots, T;\ i = 1, \dots, N,$$

with *GAP* standing for output gap per capita measured by the relative differential between actual GDP per capita and potential GDP per capita at constant prices, *Young* the young dependency ratio measured by the ratio of population aged between 0 and 14 years over working age population, *Old* the old dependency ratio measured by the ratio of population aged above 64 years old to the working age population; *GINI* stands for the pre-tax Gini coefficient.

The third pillar of secular stagnation concerns the one-off supply side damage. This feature tells us that longer spells in unemployment, due to anaemic recovery

expansion cycles and self-feeding depressions that characterize secular stagnation lead to an off-job skills depreciation that ends up constituting itself an impediment for the re-entrance in the labour market of these unemployed, thus constituting a factor for the increasing and seemingly immovable unemployment rates. We state that demographics, and an aging working age population, might also play a role in this off-job skills depreciation as an older unemployed might find it more difficult to keep up with the requirements of today's pressing technological pace of available job opportunities, making it even more difficult to re-enter employment. Accordingly, the equation that empirically verifies the one-off supply-side damage includes the human capital index and the dummy variable $\Delta g.AgWAP$ to assess that effect. $\Delta g.AgWAP$ is a dummy variable that assumes the value of 1x $AgWAP$ when the economy is in an expansion cycle defined by a positive variation in the growth rate of GDP per capita at constant prices (Δg) and 0 otherwise. $AgWAP$ gives us the aging of the working age population as a weighted average of age groups in such sample, given by:

$$AgWAP = ((\text{Pop}(15-19))/\text{WAPtotal} * 17 + (\text{Pop}(20-24))/\text{WAPtotal} * 22 + \cdots + (\text{Pop}(60-64))/\text{WAPtotal} * 62\ )$$

Equation (3) is then set by:

$$(3) \quad \Delta U_{i,t} = \beta_{0,i,t} + \omega.U_{i,t-1} + \rho.\Delta Empl_{i,t} + \varsigma.HC_{i,t} + \mu.\Delta g.AgWAP_{i,t} + \alpha.GDP_{i,t} + \tau.NetMig_{i,t} + \eta_t + \nu_i + \varepsilon_{i,t},\ t = 1,\dots,T;\ i = 1,\dots,N,$$

with ΔU standing for the variation in the unemployment rate, *U* for the unemployment rate, *ΔEmpl* the variation in the employment rate, $\Delta g.AgWAP_{i,t}$ the dummy variable previously explained and *GDP* the natural logarithm of GDP per capita at constant prices.

The lowering of nominal short term interest rates constitutes a fundamental feature of secular stagnation. In this paper, we claim this lowering to be endogenous to secular stagnation. Therefore, equation (4) includes as explaining variables for the lowering of nominal short-term interest rates all variables used to explain secular stagnation from a supply and a demand side in equations (1) and (2) respectively.

$$(4) \quad i_{i,t} = \beta_{0,i,t} + \gamma.WAP_{i,t} + \eta.HC_{i,t} + \delta.NFCF_{i,t} + \psi.PAT_{i,t} + \theta.TFP_{i,t} + \chi.Young_{i,t} + \phi.Old_{i,t} + \kappa.GINI_{i,t} + \tau.NetMig_{i,t} + \eta_t + \nu_i + \varepsilon_{i,t},\ t = 1,\dots,T;\ i = 1,\dots,N,$$

where i designates the nominal short term interest rate; subscripts i and t denote, respectively, the country and time dimensions; ηt and νi are respectively, the time effect and the country-specific effect; $\varepsilon_{i,t}$ is an unobserved zero mean white noise-type column vector satisfying the standard assumptions.

The estimation of the parameters for each equation will allow us to analyse the impact of the demographic factor for secular stagnation thus enabling us to conclude about the pertinence of immigration as a plausible policy measure within such context. As we resort to panel data techniques, where our panel is featured by $T>N$, we have firstly computed the unit roots for each time series, presented in table 1.

Table 1 – Unit roots of time series

	Levels				First differences			
	Constant		Constant and Linear Trend		Constant		Constant and Linear Trend	
Variable	t-stastic	p-value	t-stastic	p-value	t-stastic	p-value	t-stastic	p-value
PotGDP	-2.548	0.167	-2.548	0.167	-2.688	0.000	-2.860	0.008
WAP	-4.659	0.000	-4.659	0.000	-4.551	0.000	-4.659	0.000
HC	-2.629	0.089	-2.629	0.089	-2.120	0.070	-2.629	0.089
NFCF	-2.081	0.886	-2.081	0.886	-4.741	0.000	-4.853	0.000
PAT	3.370	1.000	3.370	1.000	-7.850	0.000	-6.712	0.000
TFP	-1.891	0.982	-1.891	0.982	-4.155	0.000	-4.378	0.000
NetMig	-2.758	0.026	-2.758	0.026	-2.326	0.009	-2.758	0.026
GAP	-4.046	0.000	-4.046	0.000	-3.819	0.000	-4.046	0.000
Young	-4.886	0.000	-4.886	0.000	-4.838	0.000	-4.886	0.000
Old	-4.506	0.000	-4.506	0.000	-3.820	0.000	-4.506	0.000
GINI	0.095	0.538	0.095	0.538	-11.033	0.000	-9.931	0.000
ΔU	-4.349	0.000	-4.349	0.000	-4.305	0.000	-4.349	0.000
U	-2.869	0.007	-2.869	0.007	-2.567	0.000	-2.869	0.007
ΔEmpl	-3.968	0.000	-3.968	0.000	-3.983	0.000	-3.968	0.000
GDP	-2.611	0.104	-2.611	0.104	-4.320	0.000	-4.411	0.000
Δg.AgWAP	-4.947	0.000	-4.947	0.000	-4.845	0.000	-4.947	0.000
i	-7.745	0.000	-7.745	0.000	-8.838	0.000	-7.745	0.000

Considering these results, we set the respective variable in a first difference framework when it is justified. Consequently, we will initially test if Pooled OLS or Fixed/Random effects are appropriated through the Lagrange Multiplier (LM) respectively. After that, and in case we opt to employ a fixed/random effects approach in our estimation, we conduct Hausman tests to choose between fixed and random effects. In addition, we also perform tests to verify if time-specific effects are needed to be included in our estimations, to assess heteroskedasticity based in Modified Wald test and to conclude on autocorrelation based on Breusch-Pagan LM test. Lastly, we verify cross-

sectional dependence by resorting to Pesaran (2021) test of independence, since it is a main issue of panels with long time series. As we conclude that there is cross-sectional dependence in our data and, sometimes, we register cross heteroskedasticity to correct for these issues, we estimate our results using the Driscoll and Kraay (1998) estimator with robust standard errors. This technique also allows to correct for possible endogeneity problems among the variables and then, we think that this is the best approach for our estimations. Our econometric tests point out for estimating our regressions resorting to OLS or to OLS-FE with both country- and time-specific effects. We provide the results on Hausman tests in each table.

Our empirical analysis focuses on the causality between demographic factors and secular stagnation. Therefore, we pay particular attention to previous empirical work focusing on that causality. From the contraposition of Eggertsson et al. (2019) to Acemoglu and Restrepo (2017) we learned it is crucial to insightfully choose the countries entering our sample; in fact, we do not claim secular stagnation to be a reality among all countries but only among developed mature capitalistic economies. Hence, from the nineteen-euro area countries considered by Ferrero et al. (2019) we exclude Slovenia, Cyprus, Malta, Slovakia, Estonia, Latvia and Lithuania and include the United Kingdom, Sweden, Denmark and the United States, as our sample is constituted by the Europe of the fifteen (EU15) and the United States of America (US). Another reason for this choice resides on the temporal range of data available. Because we are talking a secular trend, we intend to have the widest temporal range possible. Taking into consideration the empirical work of Ferrero et al. (2019) we cannot but wonder if data ranging just from 1990 is not somehow restrained by the inclusion of former soviet states in the sample. In conclusion, our data concerns the EU15 countries and the US ranging from 1965 to 2020. We also present estimation results for the EU15 and US economies for the sub-periods ranging from 1990 to 2020 and from 2008 to 2020. We test for the sub-period of 1990-2020 for all economies to get some base of comparison between our countries sample and Ferrero et al. (2019)'s one. We test for all countries for data ranging only from 2008 to 2020 given that figure 1 and 2 suggest altering patterns for the features analysed since 2008, which probably is not enstranged from the global financial crisis that eruptde arround that time period. Finally, we test for the period considered, from 1965 to 2020,

for only the EU15 economies to assess the claim, present in the reviewed literature, that secular stagnation is more likely to be a european reality rather than an american one.

Table 2 - Descriptive Statistics of our Database

Variable	Mean	Std. Dev.	Min	Max	Obs.
PotGDP	10.4	0.95	8.539	13.019	896
WAP	0.654	0.023	0.58	0.701	896
HC	2.866	0.477	1.345	3.774	880
NFCF	3949.716	6571.379	-1086.463	38655.527	896
PAT	232.026	179.387	5.389	914.491	595
TFP	84.585	16.572	32	126.8	896
NetMig	1.060	2.488	-1.394	17.720	848
GAP	-0.003	0.028	-0.162	0.096	896
Young	0.306	0.073	0.202	0.531	896
Old	0.225	0.047	0.118	0.366	896
GINI	0.446	0.046	0.343	0.589	670
ΔU	0.097	1.084	-3.3	6.6	880
U	0.068	0.044	0	0.275	880
ΔEmpl	0.145	1.219	-5.812	15.16	880
GDP	10.396	0.952	8.502	13.012	896
Δg.AgWAP	31.851	14.265	0	41.688	880
i	0.06	0.051	-0.005	0.246	804

Table 3 – Correlation matrix

Variables	*PotGDP*	*WAP*	*HC*	*NFCF*	*PAT*	*TFP*	*NetMig*	*GAP*	*Young*
PotGDP	1								
WAP	0.181	1							
HC	0.544	0.29	1						
NFCF	0.8	-0.065	0.189	1					
PAT	0.303	-0.022	0.667	0.169	1				
TFP	0.24	0.509	0.408	-0.015	-0.161	1			
NetMig	0.041	0.088	0.425	-0.095	0.506	0.095	1		
GAP	0.032	0.059	0.029	0.102	0.035	0.075	0.104	1	
Young	-0.352	-0.755	-0.521	-0.061	0.016	-0.78	-0.05	0.047	1
Old	0.325	0.009	0.481	0.163	-0.003	0.602	-0.033	-0.141	-0.661
GINI	-0.325	0.011	0.061	-0.354	0.119	0.272	0.53	0.078	0.014
ΔU	-0.038	-0.042	-0.101	-0.039	-0.035	-0.124	-0.107	-0.392	0.096
U	-0.099	0.128	0.101	-0.196	-0.273	0.304	0.01	-0.316	-0.29
ΔEmpl	0.099	0.165	0.181	0.069	-0.02	0.222	0.09	0.447	-0.2
GDP	1	0.183	0.544	0.801	0.304	0.241	0.044	0.062	-0.35
Δg.AgWAP	-0.016	0.018	-0.002	0.028	0.069	-0.035	0.044	0.413	0.054
i	-0.273	-0.114	-0.492	-0.033	-0.159	-0.45	-0.155	0.132	0.424
Variables	*Old*	*GINI*	*ΔU*	*U*	*ΔEmpl*	*GDP*	*Δg.AgWAP*	*i*	
Old	1								
GINI	-0.037	1							
ΔU	-0.096	-0.089	1						
U	0.301	0.047	-0.146	1					
ΔEmpl	0.117	0.111	-0.652	0.075	1				
GDP	0.32	-0.323	-0.05	-0.109	0.112	1			
Δg.AgWAP	-0.101	0.052	-0.503	-0.004	0.431	-0.003	1		
i	-0.504	-0.18	0.162	-0.078	-0.191	-0.268	-0.021	1	

Data regarding population, working age population and age groups as well as patent applications is retrieved from the World Development Indicators (WDI). Data on potential GDP, GDP, net fixed capital formation, total factors productivity, unemployment rates, employment rates and nominal short term interest rates is retrieved from AMECO database. Data on human capital index is gotten from the Penn World Table (version 10.0) and data on the pre-tax GINI coefficient is retrieved from the World

Inequality database. Data on patent applications and the pre-tax GINI coefficient is only available from 1980 on. Data involving private debt considers EU14 instead of EU15 given the inexistence of data for Luxembourg. Data on net migration is retrieved from the WDI and given this data is only available for five-year periods, we present it annually as the annual average of the respective fiver year period; data on net migration is presented in hundreds of thousands. In table 2 we present the descriptive statistics of the variables applied in our analysis and table 3 shows the respective correlation matrix.

4. EMPIRICAL ANALYSIS

4.1 – DIMINISHED LONG RUN GROWTH POTENTIAL

As apparently evident from figure 1, the growth rate of potential GDP per capita, for the EU15 and for the US, has significantly fallen from 1965 until present days, signifying a diminished long-run growth potential for these economies. This decrease was more accentuated over the last two decades, as evidenced by table 4.

Table 4 – Variation in percentual points of the annual average growth rate of potential GDP per capita at constant prices

	EU15	US
1965-2020	-0.17	-0.10
Since 2000	-0.38	-0.22
Until 2000	-0.03	-0.03

Source: AMECO (2020-09-09). Potential GDP per capita growth rates were computed by the annual variation of the ratio of potential GDP over total population. Potential GDP series were based on potential gross domestic product at 2015 reference levels from AMECO (code: OVGDP); Total population series were based on total population from AMECO (code: NPTN)

For the EU15, the growth rate of potential GDP per capita has fallen on average 0.17 p.p. per year since 1965. This decrease has been aggravated since 2000, where on average potential GDP per capita growth rates have been decreasing 0.38 p.p. per year, more than the double for the period between 1965 and 2020 and more than ten times the average decline from 1965 until 2000, when potential GDP per capita decreased on average 0.03 p.p. per year. The picture for the US economy also points to a decrease in the growth rate of potential GDP per capita since 1965, aggravating since 2000. From 1965 until 2020, potential output per capita growth rates had fallen on average 0.10 p.p. per year. Since 2000, though, the growth rate of potential GDP per capita began falling on average 0.22 p.p. per year, more than the double when compared for the overall period

and more than five times the average decline until 2000, when potential GDP per capita fell on average 0.03 p.p. per year.

As previously stated, our empirical analysis focuses on the impact of demographic factors on the four features of secular stagnation. Regarding the diminished long run growth potential measured by the variation of potential GDP per capita, the independent variable on focus is *WAP*. We also estimated the models with and without the independent variable *NetMig* to assess the impact of net migration on the four features from which secular stagnation arises. Looking at the estimation results presented in table 5, we conclude *Netmig* not to be statistically significant in explaining the diminished long run growth potential.

Table 5 – Results of potential GDP per capita, 1965-2020

	All countries		EU-15		From 1990		From 2008	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE
WAP	0.198***	0.197***	0.205***	0.188***	0.182**	0.220**	-0.130	-0.047
	(0.042)	(0.058)	(0.031)	(0.046)	(0.086)	(0.084)	(0.079)	(0.083)
HC	-0.038***	-0.039***	-0.045***	-0.046***	-0.038***	-0.045***	0.024***	0.014
	(0.008)	(0.010)	(0.009)	(0.010)	(0.013)	(0.016)	(0.007)	(0.010)
NFCF	0.000	0.000	0.000	0.000	0.000	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PAT	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP	0.003***	0.003***	0.003***	0.003***	0.003***	0.002***	0.001**	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
NetMig		-0.000		0.001		0.000		-0.001
		(0.000)		(0.001)		(0.001)		(0.000)
Observations	569	537	530	500	421	389	166	134
R-squared	0.587	0.576	0.667	0.662	0.570	0.554	0.890	0.887
Hausman test	69.30***	52.64***	65.83***	48.43***	85.55***	78.20***	72.22***	66.61***

Note: Robust standard errors clustered at the country level are reported in parenthesis. Constant term and country and time effects estimated but omitted for reasons of parsimony. *, **, *** denote significance at 10, 5 and 1% levels. A statistically significant Hausman coefficient is associated with a fixed-effect estimation.

The *WAP*, though, is significant for the overall period and for the period ranging from 1990 to 2020. The positive sign associated with its coefficient suggests that, indeed, a declining working age population constitutes a factor for a diminished long run growth potential, as a one unit decrease in the working age population induces a negative variation in potential GDP per capita of 0.198 units (0.197 considering the net migration impact), for the EU15 and US for the period considered. The fact that this variable loses its statistical significance for the sample ranging from 2008 might be explained by the magnitude of the events that unfolded from that period, with the global financial crisis and its impactful ramifications possibly clouding and diluting the contribution of other factors for the variation of potential GDP per capita.

4.2 – INCREASING AGGREGATE DEMAND SHORTAGES

Regarding the second pillar of secular stagnation, figure 1 suggests that aggregate demand shortages have become more expressive throughout the period considered. This is particularly visible by the implicit negative slope of the trend line representing the weight of the differential between GDP per capita and potential GDP per capita at constant prices. This increasing persistence of aggregate demand shortages does not necessarily mean we have been witnessing more recurrently aggregate demand shortages but that these aggregate demand shortages have become increasingly more severe. The increasing severity of these negative output gaps is attested by table 6.

Table 6 – Yearly average gap between GDP per capita and potential GDP per capita at constant prices

	EU15			US	
	€	%		USD	%
1981-1988	-239.46 €	-1.07%	1975-1977	-477.25 USD	-1.65%
1993-1999	-340.77 €	-1.23%	1980-1986	-488.39 USD	-1.47%
2009-2017	-425.99 €	-1.26%	2009-2014	-1,334.70 USD	-2.43%

Source: AMECO (2020-09-09). Output Gap per capita corresponds to the relative differential between GDP per capita and potential GDP per capita. GDP per capita series were based on gross domestic product at 2015 reference levels per head of population from AMECO (code: RVGDP). Potential GDP per capita was computed as the ratio of potential GDP over total population. Potential GDP series were based on potential gross domestic product at 2015 reference levels from AMECO (code: OVGDP). Total population series were based on total population from AMECO (code: NPTN).

For the three time periods identified as clear aggregate demand shortages, either for the EU15 and for the US, the negative differential between GDP per capita and potential GDP per capita has increased, passing, in the EU15, from -1.07% per year during the period between 1981 and 1988 to -1.26% per year during the more recent time span of 2009-2017 (less 0.19 p.p. per year). For the US, this difference between GDP per capita and potential GDP per capita passed from -1.47% per year during the period 1980-1986 to -2.43% per year during 2009-2014 (less 0.96 p.p. per year).

In the literature review, we identified, among others, two factors frequently evoked to explain secular stagnation from a demand side perspective: an aging population and increasing inequality. By looking at table 7, that depicts the results of the estimation of equation (2), once again the demographic factor prevails as an explaining variable for the increasing aggregate demand shortages illustrated in figure 1 and depicted in table 6.

Table 7 – Results of output gap per capita, 1965-2020

	All countries		EU-15		From 1990		From 2008	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS	OLS-FE	OLS-FE	OLS-RE
Young	-0.048	-0.041	-0.050	-0.030	-0.013	0.040	0.311***	0.405*
	(0.056)	(0.055)	(0.054)	(0.053)	(0.075)	(0.091)	(0.041)	(0.208)
Old	-0.174*	-0.202*	-0.178*	-0.215*	-0.134*	-0.350***	0.125	0.318**
	(0.095)	(0.114)	(0.090)	(0.108)	(0.080)	(0.111)	(0.082)	(0.113)
GINI	-0.107	-0.100	-0.092	-0.090	-0.112	-0.116	-0.089	0.172
	(0.131)	(0.135)	(0.137)	(0.141)	(0.240)	(0.161)	(0.392)	(0.232)
NetMig		0.003**		0.004**		0.006***		0.003
		(0.001)		(0.002)		(0.001)		(0.002)
Observations	654	622	600	570	464	432	176	144
R-squared	0.468	0.484	0.488	0.513	0.040	0.527	0.068	0.059
Hausman test	8.98**	15.07***	11.28**	14.23***	n.a.	14.28***	19.29***	5.13

Note: Robust standard errors clustered at the country level are reported in parenthesis. Constant term and country and time effects estimated but omitted for reasons of parsimony. *, **, *** denote significance at 10, 5 and 1% levels. A statistically significant Hausman coefficient is associated with a fixed-effect estimation.

While the explaining variable *GINI* is not significant in explaining the increasingly negative output gaps per capita, the *Old* variable evidences statistical significance for the overall period and for the period ranging from 1990 to 2020. The negative sign of this coefficient corroborates the conclusions derived by the empirical work of Eggertsson et al. (2019) about the negative impact of an aging population on aggregate demand. Considering the EU15 and US economies for the period considered, when the old dependency ratio (*Old)* increases by 1 p.p., the differential between GDP per capita and potential GDP per capita (*GAP)* decreases 0.17 p.p. (0.20 p.p. if considering the impact of net migration). Once again though, for the sample ranging from 2008*, Old* loses its statistical significance or inverts its sign from negative to positive, with the same rationale concerning the turmoil that unfolded during this period applying to explain this abnormal statistical inference.

Contrary to equation 1, the independent variable *NetMig* is significant in explaining output gaps for the period considered. The positive sign of the coefficient tells us the bigger the influx of immigrants compared to the outflow of emigrants the bigger the difference between GDP per capita and potential GDP per capita at constant prices, thus positively impacting aggregate demand relative to potential output. Most precisely, for the EU15 and US economies for the period considered, a positive variation of one hundred thousand migrants induces an increase in the differential between actual GDP per capita and potential GDP per capita of 0.3 p.p.

It must be noticed though that net migration data is presented in absolute values (one unit representing one hundred thousand net migrants) and because of that the

interpretation on the variable must be properly contextualized, as one million immigrants will not have the same impact for the US economy as it does for the Portuguese one, for example. So, when we say that a variation of three hundred and thirty-three thousand three hundred and thirty-three net migrants is susceptible of increasing output gap by 1 p.p., this interpretation applies for the representative country of the sample and should not be taken individually for a specific country that enters that pool. For that, we resort to table 8.

Table 8 – Required variation in net migration to attain a 1 p.p. increase in output gap

	Average annual population	Net migration required
Total average	**40,816,225**	**333,333**
Austria	7,873,802	64,565
Belgium	10,181,249	83,486
Denmark	5,233,409	42,914
Finland	5,011,558	41,095
Ireland	3,701,228	30,350
Italy	56,786,304	465,648
Luxembourg	4,150,64	3,404
Netherlands	15,001,930	123,016
Portugal	9,869,557	80,930
Spain	39,708,170	325,607
Sweden	8,682,366	71,195
United Kingdom	58,488,242	479,604
United States	283,452,662	2,324,312
Greece	10,105,606	82,866
Germany	79,954,147	655,624
France	58,594,302	480,473

Source: WDI (2020-09-09), data ranging from 1965 to 2020. Population series were based on total population from WDI (code: SP.POP.TOTL).

Considering the annual average population for the sixteen countries integrating our sample from 1965 to 2020 is 40,816,225 people, the 333,333 net migrants required to attain a 1 p.p. increase in output gap represent 0.82% of total population. Extrapolating this percentage for the individual countries of our sample, table 8 gives the absolute values of net migrants required to attain a 1 p.p. increase in output gap for each of those countries.

4.3 – ONE-OFF SUPPLY-SIDE DAMAGE

The one-off supply-side damage is a feature of secular stagnation according to which there is a trace of unemployment derived from recessions that is not recovered during expansion cycles due, in part, to an off-job skills depreciation that takes place during these longer spells of recession cycles. To empirically verify this sec stag manifestation, we compare the variations in GDP per capita growth rates and unemployment rates between periods that correspond to tops of expansion cycles. Taking into consideration the gap in time that might take from economic growth to produce its

effects on employment, the periods in time that correspond to tops of economic growth do not always coincide with the exact same period corresponding to bottoms in unemployment, sometimes differing a year or even two years. By looking at figure 1, we identify, from 1965 to 2020, seven periods that correspond to tops of expansion cycles and correspondent bottoms in unemployment, either for the EU15 and for the US. The results of the comparison between GDP per capita growth rates (g) and the unemployment rates (U) associated with these periods can be checked in table 9.

Table 9 - Growth rate and unemployment rate variations for tops of expansion periods

EU15						US					
	g	Δ	U	Δ			g	Δ	U	Δ	
1969	5.50%	-	2.37%	-	1969	1968	3.87%		3.50%		1969
1973	5.28%	-4.00%	2.60%	9.70%	1974	1973	4.64%	19.90%	4.90%	40.00%	1973
1979	3.37%	-36.17%	5.10%	96.15%	1979	1978	4.43%	-4.53%	5.80%	18.37%	1979
1988	3.96%	17.51%	7.48%	46.67%	1990	1984	6.30%	42.21%	7.00%	20.69%	1986
2000	3.44%	-13.13%	7.40%	-1.07%	2001	1999	3.56%	-43.49%	4.00%	-42.86%	2000
2006	2.60%	-24.42%	7.00%	-5.41%	2007	2004	2.87%	-19.38%	4.60%	15.00%	2006
2017	2.05%	-21.15%	7.00%	0.00%	2019	2018	2.38%	-17.07%	3.70%	-19.57%	2019
	Average variation	-13.56%	**Average variation**	24.34%			**Average variation**	-3.73%	**Average variation**	5.27%	

Source: AMECO (2020-09-09). GDP per capita series were based on gross domestic product at 2015 reference levels per head of population from AMECO (code: RVGDP). Unemployment rate series were based on unemployment rate from AMECO (code: ZUTN)

These clearly show that the increase in the unemployment rate for periods that correspond to tops of expansion cycles is proportionally bigger than the decrease verified in GDP per capita growth rates for the corresponding periods. In the EU15, the GDP per capita growth rates associated with a top of an expansion cycle decreased on average 13.56%. For the US, it decreased on average 3.73%. The variation in terms of unemployment rate is significantly bigger, increasing on average 24.34% for the EU15 and 5.27% for the US. This suggests that some of the unemployment occurred during recessions is not recovered during expansion cycles, thus leaving a trace of immovable unemployment that corroborates this idea of one-off supply side damage.

To understand if this trace of immovable unemployment is in part the result of an off-job skills depreciation we included in equation (3) the human capital index *(HC)* as an explaining variable. And to test if demographics might explain this off-job skills depreciation we consider the independent variable *Δg.AgWAP*. The results of the estimation of equation (3) are presented in table 10.

Table 10 – Results of variation in the unemployment rate, 1965-2020

	All countries		EU-15		From 1990		From 2008	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS-FE	OLS-FE	OLS-FE	OLS	OLS-FE	OLS-FE	OLS	OLS
U	-4.237**	-4.677**	-4.336**	-2.457	-7.089**	-8.242**	-2.115	-0.877
	(2.000)	(2.072)	(2.090)	(1.524)	(2.826)	(3.312)	(3.443)	(3.830)
HC	0.286	0.371	0.224	-0.040	0.216	0.650	-0.076	-0.005
	(0.381)	(0.448)	(0.393)	(0.079)	(0.995)	(1.572)	(0.182)	(0.273)
ΔEmpl	-0.352***	-0.342***	-0.337***	-0.396***	-0.317*	-0.282	-0.754***	-0.780***
	(0.123)	(0.124)	(0.126)	(0.111)	(0.184)	(0.188)	(0.058)	(0.057)
GDP	-5.152*	-5.340**	-5.342**	-5.891**	-9.040**	-9.697**	-6.937	-7.018
	(2.574)	(2.542)	(2.581)	(2.518)	(3.951)	(4.501)	(5.544)	(6.085)
Δg.AgWAP	-0.015***	-0.013***	-0.013***	-0.017***	-0.015***	-0.013***	-0.012*	-0.010
	(0.003)	(0.004)	(0.003)	(0.005)	(0.004)	(0.004)	(0.005)	(0.006)
NetMig		-0.087***		-0.042		-0.121***		-0.031*
		(0.030)		(0.044)		(0.041)		(0.014)
Observations	864	832	810	780	464	432	176	144
R-squared	0.579	0.579	0.570	0.483	0.623	0.627	0.741	0.742
Hausman test	16.01***	10.30*	14.81**	n.a.	27.87***	28.78***	n.a.	n.a.

Note: Robust standard errors clustered at the country level are reported in parenthesis. Constant term and country and time effects estimated but omitted for reasons of parsimony. *, **, *** denote significance at 10, 5 and 1% levels. A statistically significant Hausman coefficient is associated with a fixed-effect estimation.

The independent variable *HC* is not significant thus contradicting the rationale according to which increasing unemployment might be explained by an off-job skills depreciation. This lack of significance of human capital in explaining variations in the unemployment rate submits us to the exposed by Gordon (2015) regarding the changes in the impact of education on productivity since 1970, the period from where our data roughly ranges.

The $\Delta g.AgWAP$ variable is found to be significant for the period considered as well as for the period ranging from 1990 to 2020 but does not show the expected sign. This means that an aging working wage population contributes to a decrease in the unemployment rate, which is contrary to what we are trying to prove. This contradicting result might be explained by how the independent variable $\Delta g.AgWAP$ was constructed. By giving us the aging of the working age population only for periods when the variation in the growth rate of GDP per capita (Δg) is positive and 0 otherwise, this variable holds two contradicting effects: on the one hand, the aging of working age population is expected to increase the unemployment rate, thus a positive sign for the coefficient should be expected; but on the other hand, a positive variation in the growth rate of GDP per capita (Δg) is expected to decrease the unemployment rate, thus a negative sign should be expected. Since the estimates of $\Delta g.AgWAP$ show a negative sign, one might conclude that the second effect, the effect of a positive variation in the growth rate of GDP per capita prevails and that effect is significant for the entire period considered and for the

period ranging from 1990 to 2020. This conclusion is corroborated by the results for the estimation of the independent variable *GDP* that shows a negative and significant sign for the overall period considered as well for the period ranging from 1990 to 2020, signifying that a positive variation on GDP per capita leads to a negative variation in the unemployment rate, as expected. So, even though equation (3) does not directly include a demographic factor that is significant in explaining an increasing unemployment, indirectly this demographic factor is present given the working age population and the old dependency ratio negatively impact potential GDP per capita and GDP per capita respectively, as previously shown by the estimation of equations (1) and (2). And with *GDP* negatively affecting variations in the unemployment rate (ΔU), one might conclude that indirectly a declining working age population (*WAP*) and an increasing old dependency ratio (*Old*) induce positive variations in the unemployment rate (ΔU).

The independent variable regarding net migration is significant for all the periods considered but not for the overall period when excluding the US economy. Considering this differentiation does not apply for the statistical significance of the variable in impacting aggregate demand, as tested by the estimation of equation (2), this might indicate that the lack of significance of *NetMig* in explaining variations in the unemployment rate for the EU15 economies might be related to the differences in labour market regulations between the European and the American economies, suggesting that the higher protectionism associated with European labour markets might somehow nullify the beneficial impact of immigration on unemployment.

The negative sign of the coefficient regarding net migration means that an increase in the influx of immigrants (compared to the outflow of emigrants), leads to a decrease in the unemployment rate. More specifically, and considering all economies in the sample for the period ranging from 1965 to 2020, an increase of 100,000 net migrants leads to a decrease of 0.087 p.p. in the unemployment rate. This signifies that to achieve a 1 p.p. decrease in the unemployment rate, it would take a positive variation in net migrants of 1,149,425. The beneficial impact of immigration for the unemployment rate is reinforced if we consider the period ranging only from 1990 to 2020, for all countries considered. In that case, a variation of 100,000 net migrants induces a decrease in the unemployment rate of 0.121 p.p., which implies that for a decrease of 1 p.p. in the unemployment rate, it would take a variation of just 826,446 net migrants to achieve so. Once again, we

highlight that data for net migration is in absolute values and because of that, to adequate the above interpretations for the specific countries entering our sample, we compute table 11 in the same manner we did table 8.

Table 11 - Required variation in net migration to attain a 1 p.p. decrease in the unemployment rate

	Average annual population	Net migration required
Total average	**40,816,225**	**1,149,425**
Austria	7,873,802	222,041
Belgium	10,181,249	287,111
Denmark	5,233,409	147,582
Finland	5,011,558	141,326
Ireland	3,701,228	104,375
Italy	56,786,304	1,601,374
Luxembourg	415,064	11,705
Netherlands	15,001,930	423,054
Portugal	9,869,557	278,321
Spain	39,708,170	1,119,770
Sweden	8,682,366	244,843
United Kingdom	58,488,242	1,649,368
United States	283,452,662	7,993,365
Greece	10,105,606	284,978
Germany	79,954,147	2,254,707
France	58,594,302	1,652,359

Source: WDI (2020-09-09), data ranging from 1965 to 2020. Population series were based on total population from WDI (code: SP.POP.TOTL).

These constitute striking results as they contradict what seems to be the general idea regarding immigration as an unemployment raising policy measure. The apparent misconception that an increasing influx of immigrants raises unemployment is statistically contradicted by our estimation of equation (3). This demystification of immigration as raising unemployment might be explained by how one perceives economic activity, if from a static or a dynamic perspective. If one looks at the economy from a static perspective, then it is natural to perceive immigration as raising unemployment, given that from this point of view the number of jobs available in the economy is fixed which means that with more people (immigrants) vying for jobs, the unemployment rate must necessarily rise. But the fact is that the economy is not static but dynamic. And an influx of immigrants, as suggested by the estimation of equation (2), has a positive impact in aggregate demand and this positive impact in aggregate demand generates more income which in turn generates more demand which in turn generates more supply which in turn generates more jobs. What the estimations of equations (2) and (3) suggest is that the creation of jobs induced by immigration flows surpasses the increase in demand for jobs derived from those same immigration flows, thus positively impacting employment.

4.4 – LOW AND STICKY INTEREST RATES

What differentiates secular stagnation from mere slow growth resides on the ineffectiveness of monetary policy due to historically low and sticky interest rates – the zero lower bond problem. By looking at figure 1, the lowering of nominal short-term interest rates seems undisputable, passing from near 14% in 1982 to negative values in 2019 for the EU15 and from around 10% to near 2% for the US. Another relevant aspect suggested by figure 2 consists of the expected mirror image effect that results from the comparison between the trajectory of GDP per capita growth rates and the trajectory of nominal short-term interest rates (valid for the US from 2008 on). The reason behind this expected effect lies on the mechanism that holds conventional monetary policy a business cycle smoothing tool. As nominal interest rates decrease, access to credit is encouraged and credit granted to consumption and investment expenditures increases, so as consumption and investment themselves. The increase in consumption and investment pushes aggregate demand up. So, decreases in interest rates are associated with increases in GDP per capita and vice-versa. But within the context of secular stagnation, which is associated with the ineffectiveness of conventional monetary policy, it becomes pertinent to determine how sensitive aggregate demand is relative to negative variations in the interest rate. By analysing the variation of the GDP per capita growth rates and the variation of the nominal short-term interest rate for the four periods identified as expansion cycles ranging from 1982 to 2019, we determine the elasticity of aggregate demand to the interest rate associated with expansionary monetary policy. This elasticity is given by:

$$\Sigma AD/i = \frac{\frac{g_t - g_{t-1}}{g_{t-1}}}{\frac{i_{t-1} - i_{t-2}}{i_{t-2}}},$$

where *i* designates the nominal short term interest rate and *g* the growth rate of GDP per capita. Results presented in table 12 show how aggregate demand has become increasingly inelastic to negative variations in the interest rate.

Table 12 - Elasticity of aggregate demand to the short nominal interest rate at expansion cycles

EU15				US			
Period	Δg	Δi	ΣAD/i	Period	Δg	Δi	ΣAD/i
82-88	16.61%	-37.26%	-0.45	82-84	10.17%	-10.00%	-1.02
91-00	19.16%	-69.26%	-0.28	90-99	20.60%	-40.09%	-0.51
02-06	6.41%	-39.75%	-0.16	01-04	5.65%	-81.32%	-0.07
09-17	9.03%	-102.81%	-0.09	09-18	15.16%	-85.97%	-0.18

Source: AMECO (2020-09-09). GDP per capita series were based on gross domestic product at 2015 reference levels per head of population from AMECO (code: RVGDP). Nominal short term interest rates series were on nominal short term interest rates from AMECO (code: ISN)

These results corroborate the underlying idea regarding secular stagnation, according to which conventional monetary has become increasingly ineffective when trying to push aggregate demand back to full employment levels. It is as if this ineffectiveness could be measured by the elasticity previously computed, and the more inelastic aggregate demand is relative to negative variations in the interest rate, the more ineffective becomes conventional expansionary monetary policy. In the EU15, from 82 to 88, it took a decrease of 37.26% in the nominal short term interest rate to attain variation in growth rate of 16.61%, more than the double; from 91-00, the decrease in the nominal short-term interest rate associated with a 19.16% increase in GDP per capita growth rate was of 69.26%, more than the triple; from 02-06, for an increase in the growth rate of GDP per capita of 6.41%, the nominal short-term interest rate decreased 39.75%, more than six times; from 09-17, the interest rate decreased 102.81% for an increase in aggregate demand growth rate of just 9.03%, more than ten times. The same, even though not so expressively, can be said regarding the US.

We stated that this decreasing elasticity of aggregate demand to negative variations in the nominal short term interest rate was due to secular stagnation headwinds present in the economy, thus deeming the zero lower bond problem endogenous to secular stagnation. Accordingly, we test this endogeneity by estimating equation (4) with the independent variables used to explain secular stagnation from a supply and a demand side perspective, in equations (1) and (2) respectively. The results of this estimation are presented in table 13.

Table 13 – Results of nominal short term interest rate

	All countries		EU-15		From 1990		From 2008	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS-FE	OLS
WAP	0.313	0.352	0.336	0.349	3.085	3.412	0.168	-4.315***
	(1.990)	(2.001)	(2.148)	(2.124)	(2.458)	(2.769)	(0.553)	(0.972)
HC	-0.094***	-0.098***	-0.088***	-0.099***	-0.107***	-0.125***	-0.055***	0.001
	(0.024)	(0.025)	(0.027)	(0.028)	(0.030)	(0.035)	(0.016)	(0.002)
NFCF	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PAT	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
TFP	-0.001	-0.001	-0.001	-0.001	-0.001	-0.000	-0.000**	-0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.000)	(0.000)
Young	0.408	0.437	0.440	0.468	1.609	1.866	-0.173	-1.867***
	(0.801)	(0.810)	(0.871)	(0.867)	(1.012)	(1.155)	(0.265)	(0.419)
Old	-0.140	-0.117	-0.103	-0.083	0.910	0.979	0.077	-1.928***
	(0.813)	(0.810)	(0.877)	(0.864)	(1.145)	(1.262)	(0.229)	(0.423)
GINI	0.107	0.117	0.097	0.105	0.179	0.181	-0.006	-0.038
	(0.114)	(0.113)	(0.112)	(0.110)	(0.126)	(0.129)	(0.030)	(0.051)
NetMig		0.001		0.002**		0.002***		-0.000
		(0.001)		(0.001)		(0.001)		(0.000)
Observations	554	522	515	485	415	383	166	134
R-squared	0.890	0.886	0.897	0.893	0.848	0.853	0.768	0.338
Hausman test	65.93***	59.44***	55.21***	48.55***	76.22***	65.91***	62.65***	n.a.

Note: Robust standard errors clustered at the country level are reported in parenthesis. Constant term and country and time effects estimated but omitted for reasons of parsimony. *, **, *** denote significance at 10, 5 and 1% levels. A statistically significant Hausman coefficient is associated with a fixed-effect estimation.

Net migration is now significant in explaining the lowering of the nominal short term interest rate for the period considered when excluding the US from the sample, contrary to what happened regarding the estimation of equation (3) where net migration was only significant when including the US economy to explain variations in the unemployment rate. But from 1990 on, this explaining variable is significant considering all countries in the sample. By positively impacting the nominal short term interest rates, a rise in net migration signifies increasing the nominal short term interest rate and being the lowering of interest rates a fundamental feature of secular stagnation, immigration appears also for this feature as a plausible solution. For the period ranging from 1990 to 2020, considering all countries in the sample, a variation of 100,000 in net migration leads to an increase of 0.2 p.p. in the nominal short term interest rate. This means that a net influx of 500,000 immigrants would have the impact of raising the nominal short term interest rate by 1 p.p.. As in tables 8 and 11, we compute the level of net migration required, for each country of the sample, to attain an increase of 1 p.p. in the nominal short term interest rates. But unlike tables 8 and 11, results presented in table 14 consider the period ranging only from 1990 to 2020, given being the period in which the estimates of net migration are significant for all countries in the sample.

Table 14 - Required variation in net migration to attain a 1 p.p. increase in the nominal short term interest rate

	Average annual population	Net migration required
Total average	**42,650,666**	**500,000**
Austria	8,186,921	95,787
Belgium	10,548,668	123,419
Denmark	5,414,925	63,355
Finland	5,246,307	61,382
Ireland	4,106,257	48,043
Italy	58,140,354	680,242
Luxembourg	467,936	5,475
Netherlands	16,124,429	188,656
Portugal	10,308,104	120,605
Spain	42,944,750	502,454
Sweden	9,121,814	106,725
United Kingdom	60,658,014	709,699
United States	296,236,511	3,465,967
Greece	10,799,218	126,351
Germany	81,686,761	955,735
France	62,419,682	730,310

Source: WDI (2020-09-09), data ranging from 1990 to 2020. Population series were based on total population from WDI (code: SP.POP.TOTL).

Considering the annual average population of the sixteen countries integrating our sample from 1990 to 2020 is 42,650,666 people, the 500,000 net migrants required to attain a 1 p.p. increase in the nominal short term interest rate represents 1.17% of total population. Extrapolating this percentage of required net migration on total population for the individual countries of our sample, table 14 gives the absolute value of net migration required to attain a 1 p.p. increase in the nominal short term interest rate for each of those countries.

5 – CONCLUSIONS AND POLICY IMPLICATIONS

There are several factors among developed economies that prevent a natural and healthy process of economic growth. The set of these factors and its consequences came to be known as secular stagnation. The way usually found to cope with this stagnation has been through expansionary monetary policy. But the repeated manipulation of interest rates in a time where the factors for secular stagnation aggravate leads to a process of a continuous and gradual lowering of interest rates until a point where there is no more room for further impactful decreases (the zero lower bond problem), rendering monetary policy ineffective.

Not only the repeated use of monetary policy within the context of secular stagnation leads to its own ineffectiveness but it also turns economic growth in these economies dependent of debt, making them more susceptible to financial instability and

more prone to financial crises. Given this ineffectiveness and unsustainability, it becomes urgent to rethink the full employment policy framework in times of secular stagnation. Because we theoretically derived the cited unsustainability from the temporal inadequacy of employing policy measures conceived to deal with temporary shocks in a context of a long-lasting event, we rule out from this imperative rethinking monetary and fiscal policy. Instead, when proposing an effective and sustainable policy framework to deal with secular stagnation, we focus on policy measures that aim at eliminating or at least mitigating the factors causing such stagnation. And if there is an impactful and transversal factor causing secular stagnation that is demographics, as empirically evidenced. And if a declining working age population and an aging population constitute a fundamental factor for secular stagnation then immigration must inevitably be considered a plausible solution in this imperative rethinking of a policy framework.

This conclusion is fully corroborated by our empirical analysis which shows that the influx of immigrants positively impacts aggregate demand, contributes to diminish the unemployment rate and leads to increases in the nominal short term interest rate, impacting three of the four pillars of secular stagnation and, thus, proving to be a pertinent policy measure within such macroeconomic context.

Given then the relevance of immigration as a possible solution in times of secular stagnation, it becomes pertinent to assess how this translates into the current policy framework of developed economies.

Table 15 – Recommended and actual net migration quotas in a policy framework context

	Required NetMig to increase GAP by 1 p.p.	Required NetMig to decrease U by 1 p.p.	Required NetMig to increase i by 1 p.p.	Average annual NetMig	
Austria	64,565	222,041	95,787	27,617	0.35%
Belgium	83,486	287,111	123,419	26,495	0.26%
Denmark	42,914	147,582	63,355	10,389	0.20%
Finland	41,095	141,326	61,382	5,575	0.11%
Ireland	30,350	104,375	48,043	6,591	0.18%
Italy	465,648	1,601,374	680,242	99,094	0.17%
Luxembourg	3,404	11,705	5,475	4,532	1.09%
Netherlands	123,016	423,054	188,656	24,453	0.16%
Portugal	80,930	278,321	120,605	1,829	0.02%
Spain	325,607	1,119,770	502,454	114,855	0.29%
Sweden	71,195	244,843	106,725	26,856	0.31%
UK	479,604	1,649,368	709,699	124,524	0.21%
US	2,324,312	7,993,365	3,465,967	908,798	0.32%
Greece	82,866	284,978	126,351	14,012	0.14%
Germany	655,624	2,254,707	955,735	226,543	0.28%
France	480,473	1,652,359	730,310	74,704	0.13%

Source: WDI (2021-04-27). Population series were based on total population from the WDI (code: SP.POP.TOTL). Net migration series were based on net migration from the (code: SM.POP.NETM)

Looking at table 15, only Luxembourg has an annual average immigration quota susceptible of increasing output gap by 1 p.p. but still insufficient to impact the unemployment rate and the nominal short term interest rate in the same manner. All the other countries in the sample fail to meet the necessary immigration quotas to increase the output gap, to decrease the unemployment rate and to increase the nominal short term interest rate by 1 p.p.. This suggests that the level of net migration registered for these developed economies is insufficient to significantly impact those features and/or that the current immigrant accommodation policies are not capable nor even designed to extract the full economic potential of immigration, revealing this way how immigration is looked at in today's developed economies: as a problem rather than a solution.

It is important to stress though that our dissertation does not assess immigration qualitatively but only quantitatively. It does not characterize the type of immigration, in terms of qualifications, gender or age groups faced by developed economies. It does not look into the migration policies currently in place in developed economies. It does not even empirically verify if the fact that the impact of net migration on the unemployment rate is only significant when considering the US economy is due to more flexible labour market regulations or not. These are all answers that should be given in future work on the subject. Our paper does not give, nor does it intend to, a definite answer regarding immigration in a context of secular stagnation, it only changes the question. Instead of asking "How do we deal with the immigration crises?" we should be asking "How do we take full advantage of the immigration opportunities?"

One final note of warning regarding the current context of the coronavirus pandemic crisis. We initially told that the irrelevance at which Hansen (1939)'s first predictions of secular stagnation were voted in did not mean Alvin Hansen was wrong but only that the world drastically changed afterwards, namely with the second world war and the consequent increase in public expenditure as well as the baby boom that followed in the US. Well, today we are facing probably the closest proxy of a world war without being an actual war, with the COVID pandemic crisis. Already in motion seems to be an unprecedented frontload of expansionary fiscal policy in Europe and in the US. It is important not to be anesthetized by the effects of this expected expansionary fiscal policy that aims to fight the temporary shock of the pandemic crisis and should not be misconceived as a solution for the problematic of secular stagnation. The incumbent

numbness shall be resisted in avoiding the inertia to not do what needs to be done regarding structural policy measures. So, I close as it (re)began, with the words of Lawrence H. Summers:

"*It is certainly possible that some major exogenous event will occur that raises spending or lowers saving in a way that raises the FERIR in the industrial world and renders the concerns I have expressed irrelevant. Short of war, it is not obvious what such events might be"* Summers (2014)

References

Acemoglu, D., & Restrepo, P. (2017). Secular Stagnation? The Effect of Aging on Economic Growth in the Age of Automation. *American Economic Review, 107*(5), 174-179.

Backhouse, R., & Boianovsky, M. (2016). Secular stagnation: The history of a macroeconomic heresy. *The European Journal of the History of Economic Thought, 23*(6), 946-970.

Blanchard, O. J., Furceri, D., & Pescatori, A. (2014). A prolonged period of low real interest rates? Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes and Cures* (pp. 101-110). London: CEPR Press.

Blecker, R. A. (2016). The US economy since the crisis: slow recovery and secular stagnation. *European Journal of Economics and Economic Policies, 13*(2), 203-214.

Bresser-Pereira, L. (2019). Secular Stagnation, Low Growth, and Financial Instability. *International Journal of Political Economy, 48*(1), 21-40.

Buchner, M. (2020). Fiscal Policy in an Age of Secular Stagnation. *Comparative Economic Studies, 62*, 398-429.

Caballero, R. J., & Farhi, E. (2014). On the role of safe asset shortages in secular stagnation. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes, and Cures* (pp. 111-122). London: CEPR Press.

Driscoll, J. C., & Kraay, A. C. (1998). Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. *The Review of Economics and Statistics, 80 (4)*, 549-560.

Eggertsson, G. B., & Mehrotra, N. (2014). A model of secular stagnation. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes, and Cures* (pp. 123-129). London: © CEPR Press, 2014.

Eggertsson, G. B., & Mehrotra, N. (October de 2014). A model of secular stagnation. *NBER Working Paper Series*, pp. 1-53.

Eggertsson, G. B., Lancastre, M., & Summers, L. H. (2019). Aging, Output Per Capita, and Secular Stagnation. *American Economic Review, 1*(3), 325-342.

Eggertsson, G. B., Mehrotra, N. R., & Robbins, J. A. (2019). A Model of Secular Stagnation: Theory and Quantitative Evaluation. *American Economic Journal, 11*(1), 1-48.

Eggertsson, G. B., Mehrotra, N. R., & Summers, L. H. (2016). Secular Stagnation in the Open Economy. *American Economic Review, 106*(5), 503-07.

Eichengreen, B. (2014). Secular stagnation: A review of the issues. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes and Cures* (pp. 41-46). London: CEPR Press.

Eichengreen, B. (2015). Secular Stagnation: The Long View. *American Economic Review, 105*(5), 66-70.

Ferrero, G., Gross, M., & Neri, S. (2019). On secular stagnation and low interest rates: Demography matters. *International Finance, 22*(3), 262-278.

Glaeser, E. L. (2014). Secular joblessness. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes and Cures* (pp. 69-80). London: CEPR Press.

Gordon, R. J. (2014). The turtle's progress: Secular stagnation meets the headwinds. Em C. Teulings, & B. Richard, *Secular Stagnation: Facts, Causes and Cures* (pp. 47-59). London: CEPR Press.

Gordon, R. J. (2015). Secular Stagnation: A Supply-Side View. *American Economic Review, 105*(5), 54–59.

Hansen, A. (1939). Economic Progress and Declining Population Growth. *The American Economic Review, 29*(1), 1-15.

Jimeno, J. F., Smets, F., & Yiangou, J. (2014). Secular stagnation: A view from the Eurozone. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes and Cures* (pp. 153-164). London: CEPR Press.

Koo, R. C. (2014). Balance sheet recession is the reason for secular stagnation. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes and Cures* (pp. 131-142). London: CEPR Press.

Krugman, P. (2014). Four observations on secular stagnation. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes and Cures* (pp. 61-68). London: CEPR Press.

Mokyr, J. (2014). Secular stagnation? Not in your life. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes and Cures* (pp. 83-89). London: CEPR Press.

Park, H. M. (01 de October de 2011). Practical Guides To Panel Data Modeling: A Step by Step Analysis Using Stata. *Practical Guides To Panel Data Modeling: A Step by Step Analysis Using Stata*, pp. 1-53.

Pesaran, M. (2021). General diagnostic tests for cross-sectional dependence in panels. *Empirical Economics, 60*, 13-50.

Probst, J. (2019). Lawrence Summers Deserves a Nobel Prize for Reviving the Theory of Secular Stagnation. *Economic Journal Watch, 16*(2), 342-373.

Ramey, V. A. (2020). Secular Stagnation or Technological Lull? *Journal of Policy Modeling*, 1-26.

Summers, L. H. (2014). Reflections on the 'New Secular Stagnation Hypothesis'. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes, and Cures* (pp. 27-38). London: CEPR Press.

Summers, L. H. (2014). U.S. Economic Prospects: Secular Stagnation, Hysteresis, and the Zero Lower Bound. *Business Economics, Vol. 49*(No. 2), 65-73.

Summers, L. H. (2014). U.S. Economic Prospects: Secular Stagnation, Hysteresis, and the Zero Lower Bound. *Business Economics, 49*(2), 65-73.

Summers, L. H. (2015). Demand Side Secular Stagnation. *American Economic Review, 105*(5), 60-65.

Summers, L. H. (2015). Have we Entered an Age of Secular Stagnation? IMF Fourteenth Annual Research Conference in Honor of Stanley Fischer, Washington, DC. *IMF Economic Review, 63*(1), 277-280.

Summers, L. H. (2016). The Age of Secular Stagnation: What It Is and What to Do About It. *Foreign Affairs, 95*(2), 2-9.

Teulings, C., & Baldwin, R. (2014). *Secular Stagnation: Facts, Causes, and Cures.* London: CEPR Press.

Wolff, G. B. (2014). Monetary policy cannot solve secular stagnation alone. Em C. Teulings, & R. Baldwin, *Secular Stagnation: Facts, Causes and Cures* (pp. 143-150). London: CEPR Press.