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Research Statement

I am an applied economist with a very versatile toolbox, working on theory and empirical methods involving both reduced-form and structural estimations. My primary field is International Trade, but my research also includes related topics such as consumer theory, income inequality, foreign direct investment (FDI), institutions (financial markets in particular), economic geography, industrial organization and the boundaries of the firm.

What determines trade patterns between firms and between countries? How does trade affect welfare and inequality? Most of my research revolves around these two central questions, and more precisely relates either to income inequality, and its link to consumption patterns, or supply chains. Both themes have become central in the field of International Trade. Within these broad themes, several papers written over the past few years contribute to the core subjects of the ARE department, including: energy consumption and CO2 emissions (Caron and Fally 2018), trade in primary commodities (Fally and Sayre 2018), retail shopping and food consumption (Faber and Fally 2017; Fally, Levin, Russ and Villas-Boas, ongoing project), and in particular food expenditures in developing countries (Atkin, Faber, Fally, Gonzalez-Navarro 2018).

Publication record. My research has been published and is considered for publication in top-ranking journals, including two articles in top-five journals (*Quarterly Journal of Economics*, R&R at the *Review of Economic Studies*), three in other general-interest journals (*Review of Economics and Statistics*, *American Economic Review P&P*, *Economic Policy*) and several in the best journals in my fields (*Journal of International Economics*, *Journal of Development Economics*). In addition to the eight publications, I have two papers invited for resubmission (R&R). I also have five working papers that have been submitted to leading journals and have been widely presented.

Overall visibility. I have been invited to present at conferences and seminars in the best departments in the US and overseas. Since June 2013, I have presented my work and participated in more than sixty high-level conferences and seminars.¹ This year alone, my work has been presented at four NBER meetings. My papers are increasingly cited with about 1,800 citations in Google Scholar, including seven papers with more than 100 citations. Also, I have been invited to join the *National Bureau of Economic Research* (NBER) as a Research Fellow since May 2015, and the *Center for Economic Policy and Research* (CEPR) since May 2017.

The remainder of this statement describes my work, organized around three main axes: A) Income effects in consumption and income inequality; B) Sourcing strategies and production chains; C) Firm creation and firm dynamics.

¹ An extensive list is provided in my CV.

A. Income inequality and income effects in consumption

One of the most pressing challenges of our time is the very wide income inequality across countries, and across individuals within countries. My research examines some of the sources and consequences of income inequality, as well as new insights on how to measure inequality. In particular, I emphasize the role of demand patterns, as both a source and a consequence of inequality. Income differences lead to very wide differences in consumption baskets, which we refer to as non-homotheticities.² In turn, these differences in consumption influence the supply side of the economy, such as trade patterns, pollution and carbon emissions, firm size distribution, product quality and relative prices. Conversely, I examine how changes in the supply side (e.g., productivity growth or trade liberalization) influence income inequality through general-equilibrium effects where the demand side plays an important role. Finally, I contribute to the theoretical literature on how to model demand patterns with more flexible income effects, along with providing useful applications.

This line of research includes six completed papers (including one published and two R&R) and several ongoing research projects. All contribute to a recent burgeoning fast-growing literature emphasizing the role of income effects on the demand side that has largely been ignored in previous work in international trade, development and macroeconomics. My papers develop a variety of models and applications in wide range of contexts. These include, for instance, a theory paper on the structure of preferences, an empirical study of US household scanner data, a methodology paper on the use of expenditure survey data to measure welfare changes across households, and numerical simulations to illustrate the quantitative relevance of consumption patterns for the relative wage of skilled vs. less skilled workers. Among completed papers, I would like to highlight three papers (discussed below) with the highest publication potential: “International Trade Puzzles: a Solution Linking Production Factors and Demand” (published in the *Quarterly Journal of Economics*), “Firm Heterogeneity in Consumption Baskets: Evidence from Home and Store Scanner Data” (invited for revision by the *Review of Economic Studies*), and “A New Engel on the Gains from Trade” a new paper that we have been invited to present at the top conferences and economics departments.

1. Solving trade puzzles. My first paper on this topic, “International trade puzzles: a solution linking production factors and demand”, (*Quarterly Journal of Economics* 2014), is co-authored with Jim Markusen and Justin Caron. Previous work in international trade has mostly ignored income effects in consumption, and typically assumes that consumption baskets do not depend on income levels. One reason why the demand side has received less attention is that income effects in consumption (non-homotheticities) are difficult to identify as they can often be confounded with supply side effects (such as comparative advantage affecting consumption baskets through relative prices). In this paper, we develop a methodology that allows us to identify the role of income and disentangle demand and supply-side effects. We apply our methodology to harmonized cross-country and cross-sector data on trade, production and consumption. Using our estimates of consumer preferences, which are general enough to allow for income effects, we show that several puzzles can be at least partially answered, qualitatively and quantitatively. First, we document a new stylized fact showing that income-elastic goods (i.e. goods that account for a larger expenditure share in high-income households) tend to require relatively more skilled workers in production, a new fact highlighting a close link between demand and supply sides. Second, we

² Most existing work assumes *homothetic* preferences, which imply that rich and poor household have the same expenditure shares on all goods if they face the same prices.

show that income effects in consumption can explain why imported goods in high-income countries do not rely very much on unskilled labor, in spite of high-income countries having a comparative disadvantage in low-skill intensive task. This sheds light on the “missing trade puzzle” in international trade (Trefler, 1993). We also use income effects in consumption to explain two other trade puzzles: why low-income countries do not trade as much as high-income countries, and why only a small fraction of exports from low-income countries go to high-income countries. As the paper relates to several traditional research topics in international trade, it appears in various course syllabi taught in the field.³

2. Implications for inequality. In a related paper also coauthored with Justin Caron and Jim Markusen, “Per capita income and the demand for skills” (R&R at the *Journal of International Economics*), we provide a new explanation of the rising inequality between skilled and less-skilled workers in many countries. Our theory relies on the key insight of the above-mentioned paper, that the production of income-elastic (luxury) goods tend to be more intensive in skilled labor relative to less-skilled labor. Given this relationship between characteristics of the goods (linking production and demand), we obtain that an increase in productivity, which causes per capital income to rise, leads to a change in consumption baskets and a shift in consumption towards skill-intensive goods. In turn, this leads to an increase in the relative demand for skilled workers in the economy and an increase in their wage relative to less-skilled workers. Previous literature on inequality (particularly the skill premium) focused on the supply side and mostly ignored demand-driven mechanisms. We show that this new mechanism is both qualitatively and quantitatively relevant, and can explain an important part of the dramatic increase in skill premium observed over the past decades across many countries.

3. Demand-driven technological bias. I am writing a related paper on this issue with Justin Caron and Cecilia Fielser, “Home-Market Effects on Innovation”, which is still work in progress (not yet submitted). In this paper, we examine the implications of income effects in demand for the types of technology innovations across sectors when technologies tend to be developed with the goal of enhancing the productivity of specific factors of production (e.g. skilled vs. less-skilled workers). In particular, we examine the consequences of income effects for the skill bias of technology, i.e. the increasing productivity of skilled workers relative to unskilled workers. In this paper, we explain why technologies used to produce income-elastic goods (luxury goods) tend to be better suited for skilled workers, explaining the key stylized fact at the core of papers 1 & 2 discussed above (Caron, Fally and Markusen 2014 & 2017). We show that this bias is a natural consequence of the correlation between income per capita, by determining the type of goods that tend to be consumed and produced, and the availability of skilled workers, which influences the type of innovations. We also examine the consequences of income effects in consumption for inequality in such a framework, allowing for innovation responses that are endogenous and directed towards specific types of workers.

4. Implications for energy demand and CO₂ emissions. Continuing in this line of research, Justin Caron and I examine implications of income-driven differences in consumption patterns for energy demand and CO₂ emissions across countries. Our paper, “Per capita income, consumption patterns, and CO₂ emissions”, is under review at the *Journal of the Association of Environmental and Resource Economists*. In this paper, we provide evidence of a negative correlation (an inverted-U-shaped relationship) across sectors between income elasticity in consumption

³ E.g lectures by Kiminori Matsuyama (Northwestern), Elhanan Helpman (Harvard), James Anderson (Boston College), Pablo Fajgelbaum (UCLA), Gordon Hanson (UCSD), Ralph Ossa (Chicago), and cited in the reference textbook on International Trade (Feenstra, 2015) at the graduate level.

and the CO₂ intensity of production, which implies that richer consumers tend to purchase goods and services that are less CO₂ intensive. At the country level, the data also exhibit an inverted-U-shaped relationship between per capita income and the average CO₂ content of both consumption and production, which we find to be partially generated by differences in income-effects in consumption with non-homothetic preferences. In other words, differences in consumption baskets can explain why middle-income countries have higher CO₂ emissions than the richest countries. Using general equilibrium simulations, we show that such mechanism slightly mitigates the positive effect of income growth on CO₂ emissions, with very heterogeneous implications across countries: income growth leads to lower emission intensity in high-income countries but higher emission intensity in low-income countries. These findings can inform policy makers about the impact of growth on CO₂ emissions as well as future geography of emissions, and indicate that demand-side effects are important and should be incorporated in emissions projections.

5. Implications for inequality through cost-of-living differences. In a paper with Ben Faber ("Firm Heterogeneity in Consumption Baskets: Evidence from Home and Store Scanner Data", R&R at the *Review of Economic Studies*), I also study the relationship between consumption patterns and supply-side characteristics, and how this relationship can shed light on income inequality, now using very different tools, data, modeling and estimation. Using extremely rich household and retail consumption data (AC Nielsen Retail and Home Scanner data), we examine how differences in productivity and quality across firms map onto differences in consumption baskets and consumption prices indexes across households. We find that high-income households tend to buy from significantly larger and more efficient producers relative to low-income households. We consider the role of both quality and markups, and we find that this pattern is mainly driven by large quality differences across firms and differences in the value placed on quality across households of different income levels. To explain these patterns, we develop a simple model with non-homothetic preferences and economies of scale in the production of quality. We then use our estimated model to illustrate the role of income distribution and trade in generating endogenous differences in quality and prices across household consumption baskets, with large repercussions for inequality across households through differences in prices. We find that an increase in earnings inequality leads to an even larger increase in real income inequality once we adjust for the cost of living, accounting for endogenous firms' responses in terms of quality and scale when they cater to richer consumers. We also show that further trade liberalization can lead to widening welfare inequality through similar channels.

6. Measuring changes in real income inequality. Measuring the evolution of welfare across households is very challenging in practice as it involves, in principle, collecting very detailed information on prices, quantities, quality, availability of products, etc. across households by service and product variety. Recent papers (including the one with Ben Faber described just above) have taken on that challenge by bringing to bear even more detailed consumer microdata down to the level of barcodes. A limitation of that approach is that such data are not available in most contexts and only cover parts of consumption baskets (typically only 20% of expenditures), ignoring big chunks of the economy such as services. Rather than trying to access new data, in a paper with David Atkin, Ben Faber and Marco Gonzalez-Navarro ("A New Engel on the Gains from Trade") we develop a new methodology to estimate changes in welfare across households by exploiting existing expenditure surveys available in many countries. The general idea is to exploit income-effects in consumption and observed changes in consumption baskets to infer changes in welfare. We show theoretically that, under fairly general conditions, we can use shifts of and movement along "relative Engel curves" (relationship between expenditure share within a group of goods and nominal income) to infer welfare changes across the income distribution.

We describe under which conditions this theoretical result can be implemented in practice (correcting for selection biases and conditions imposed on the realization of price changes within some groups of goods) and apply our estimation strategy to measure welfare changes across districts in India between 1988 and 2000. We find that inflation is lower for richer households relative to what one could obtain from standard approaches based on price data on a subset of the consumption basket. We also use our results to re-estimate the impact of trade liberalization in India during that period, and find that the effect of trade liberalization has been fairly homogeneous across the income distribution. Beyond the India example, we plan to apply this method in a variety of context, and many researchers have already inquired about our theoretical and empirical results. We have been invited to present this paper at the best conferences in our field (e.g. NBER summer institute in trade as well as development) and for seminars at the best economics departments (Harvard/MIT, Princeton and Stanford) and the World Bank.

7. Modeling price and income effects with simple demand systems. A seventh paper in this line of work ("Integrability and Generalized Separability", under review in the *Journal of Economic Theory*) examines demand systems where the demand for a good depends only on the price of that good, the income of the consumer, and a single price index summarizing information on all other prices—property referred to as “generalized separability”. I prove a claim by Gorman (1970) that such a demand system can take only one of two simple forms if we assume that consumers are rational. More importantly, I provide simple conditions that need to be satisfied such that these two simple forms can actually be obtained from rational consumer preferences. I also document the properties of such demand system, especially in terms of price and income effects, and how to measure consumer welfare with this type of demand. These results are and will be very useful to applied economists in various fields (especially in industrial organization, trade and macroeconomics) who want to examine simple yet fairly general demand systems where all relevant price information takes a fairly simple form.

8. Gains from trade under such preferences. In a short companion paper ("Generalized Separability and the Gains from Trade", under review), I examine the gains from trade in a model where preferences take the flexible form described above (generalized separability) with standard assumptions about the supply side. This work generalizes previous models that either assume homothetic, directly-separable or indirectly-separable preferences, where these assumptions lead to sharp implications for the quantitative gains from trade, conditional on estimated elasticities of trade to trade costs and observed import penetration. Under generalized separability, we allow for more flexible price and income effects while retaining the property that prices can be summarized by a single aggregator, which is particularly convenient under monopolistic competition. Given the added flexibility, we obtain a wider range of predictions for the gains from trade, highlighting the crucial role of the demand side. In particular, such demand systems yield price levels that depend more flexibly on trade costs as well as income levels.

B. Sourcing and supply chains

Another major issue characterizing the global economy over the past few decades is the emergence of global value chains, in which production has become increasingly complex and fragmented across countries. This line of research is where I have worked the longest, and includes some of my most cited work. It includes eight completed papers and several ongoing research projects. I again attack the issue from various angles: I have contributed to the measurement of supply chain position, the analysis of productivity spillovers and technology transfers along

supply chains, the source of comparative advantage along supply chains, and most recently the role of primary commodities.

9. Indexes on the fragmentation of production to study supply chains. In a working paper entitled "On the fragmentation of production in the US" (Fally, 2012), I examine the evolution of the number of production stages in the US over more than 50 years. I develop a novel index of vertical fragmentation corresponding to the average number of production stages weighted by value added at each stage. This index can be calculated from input-output tables and does not require plant-level data. I also develop a second index to reflect the average number of production stages between an industry's output and final demand ("distance to final demand" or "upstreamness"). Those downstream industries are, for instance, more advertising-intensive and less capital-intensive, and produce more specific goods. Interestingly, I find a decline in the weighted average number of plants involved sequentially in production chains since 1947 (which is the first available input-output matrix), regardless of whether I include services or focus on commodities and manufacturing goods. Half of this decline corresponds to a shift of value-added towards industries that are closer to final demand (farther downstream). In other words, intermediate goods are becoming less important in terms of relative value-added contribution. By looking at worldwide trade flow patterns, I show that this feature is not just specific to the US. Although this paper has not been published, it has been widely cited, and the two indexes are now computed and published by policy institutions such as the OECD.

10. More on upstreamness. A related question is whether certain countries specialize in different parts of the value chain. Pol Antras, Davin Chor, Russell Hillberry and I address this question in a paper "A measure of upstreamness of production and trade flows" (*American Economic Review*, P&P, 2012) to characterize the position of a country's exports on production chains. We use the second index mentioned above ("distance to final demand" or "upstreamness") computed on a country basis. Contrary to what has been predicted by the theoretical literature on this topic, we find no significant correlation with per capita income. However, we do find a negative correlation between the rule of law and average upstreamness across countries, suggesting that countries with better institutions tend to specialize in downstream industries.

11. Explaining fragmentation and specialization along supply chains. In "A Coasian Model of International Production Chains" (*Journal of International Economics*, 2018), Russell Hillberry and I develop a model of production chains that addresses two of the most important shortcomings of existing frameworks: 1) we treat the length of production chains, i.e. the number of firms involved sequentially in production chains, as an equilibrium outcome, and 2) we allow for countries to specialize at different points along production chains and across multiple chains. Such a model is inherently very complex, but we obtain closed-form solutions for a wide range of statistics. We also calibrate the model using data from 10 Asian countries and the US and illustrate the effect of various hypothetical policy changes with counterfactual simulations (e.g. the effect of a decrease in trade costs, the effect of an increase in productivity in China).

12. Primary commodities are crucial to understand the gains from trade. In a paper with my student James Sayre ("*Commodity Trade Matters*", under review in the *American Economic Journal: Macroeconomics*), we examine the role of some of the most upstream inputs: primary commodities. International trade in commodities has declined over the past decades as a share of total trade. Nevertheless, commodities enter the production processes of all goods and remain crucial for supply chains. We show that ignoring specific features of trade in agricultural and

mineral commodities leads to a significant understatement of aggregate gains from trade, which is particularly relevant as the gains from trade implied by standard models tend to be small. These specific features include: i) a low sensitivity of demand to a change in the commodity price and difficulty in finding substitutes (e.g. the importance of copper in the electronics sector), ii) low sensitivity of supply to changes in prices, and iii) an uneven dispersion of natural resources needed to produce commodities and, correspondingly, a high concentration of production among a few countries. We quantify the gains from trade and the role of commodities by incorporating these features into a general-equilibrium model of trade and input-output linkages. To calibrate the model, we gather data on trade, production, consumption, and supply and demand elasticities (i.e. the sensitivity of supply and demand to prices) across commodities and countries at a finely disaggregated level, and we provide the data online as an additional contribution of the project. Relative to autarky, we find that the gains from trade are several times larger than predicted by previous models, especially for small countries. Primary commodities also matter for relatively smaller changes in trade costs and tariffs. This result is important given the current debate on limiting trade.

In addition to the papers mentioned above on supply chains, I have worked on a few other papers and projects related to sourcing decisions and comparative advantage along supply chains.

13. Financial development as a determinant of comparative advantage and firm organization. “Global sourcing under imperfect capital markets” (Carluccio and Fally, *Review of Economics and Statistics*, 2012) examines two other very important questions that highlight the role of financial market development. First, how does access to finance affect the patterns of comparative advantage? Second, how does access to finance affect the organization of production and firm ownership structure? We build a model that predicts that (1) complex and specific inputs are more likely to be sourced from financially developed countries and (2) multinationals are more likely to integrate suppliers that are located in countries with poor financial institutions, especially when trade involves complex goods. We test our model using unique firm-level trade data on multinational firms with operations in France. These data provide information on the value of trade flows by firm, source country and traded product, as well as the share of trade with affiliated suppliers (intra-firm trade). The data provide full support of our predictions: financial development leads to a comparative advantage in relatively more complex goods subject to hold up problems, and lack of access to external finance leads to a higher share of vertically integrated suppliers.

14. Foreign disruption of local supply chains. In a theoretical paper co-authored with Juan Carluccio, “Foreign entry with technological incompatibilities in the supply chain” (*Journal of International Economics* 2012), we study the effect of the entry of multinational firms on host economies. An important policy question for developing countries is whether and how they could benefit from the presence of foreign multinational firms, a question which has been the focus of hundreds of empirical papers with often mixed and contradictory results. We examine how these externalities from multinational firms are affected by incompatibilities between foreign and domestic technologies, and how these incompatibilities can explain the results obtained in the empirical literature.

15. Explaining regional inequality with access to supply and demand. Another paper, “Economic geography and wages: evidence from micro-data in Brazil” (with Rodrigo Paillacar and Cristina Terra, published in the *Journal of Development Economics*) shows how wage inequality across Brazilian regions depends on geography and proximity to suppliers and consumers. Using detailed micro-data across all Brazilian workers and firms in the formal manufacturing sector (RAIS and PIA datasets) as well as intra- and inter-national trade data at the Brazilian state

level, we find that market access (proximity to consumers), especially national market access, explains a very large fraction of inequalities across regions while supplier access explains only a small fraction of the differences in wages.

16. Estimating general equilibrium effects in “gravity equations” for international trade. In a methodology paper “Structural Gravity and Fixed Effects” (published in the *Journal of International Economics*), I investigate the difference between several econometric specifications of the estimation of so-called gravity equations, a well-known relationship between trade flows and distance, when we account for general-equilibrium effects for both importers and exporters (for both final goods and intermediate goods). I describe the equivalence between several approaches, and I document adding-up properties of the Poisson Pseudo-maximum-likelihood estimator that are particularly convenient for the estimation of gravity. This paper has been widely cited given the central role of the gravity equation in trade (and other applications such as migration and commuting flows) and the practicality of these econometric results.

C. Firm creation and firm dynamics

The entry and growth of new firms is a key driving force of economic growth. Recent work shows that firm entry and dynamics can shed light on innovation and productivity growth, misallocation, trade, foreign direct investment, and other outcomes. My work investigates the role of access to finance and openness to trade in influencing firm creation and firm dynamics, and thus indirectly economic growth.

17. Determinants of firm entry and firm growth. It has long been recognized that entrepreneurship and the creation of new firms is a driving force of economic growth, and that it is crucial to better understand how economic regulations and business environment can help foster firm creation. In “Credit constraints as a barrier to the entry and post-entry growth of firms” with Philippe Aghion and Stefano Scarpetta (*Economic Policy*, 2007), we show empirically that financial development boosts the entry and post-entry growth of firms, using new harmonized data on entry rates and firm growth by cohort collected jointly by the OECD and the World Bank. Moreover, we find that financial development primarily fosters the entry of small firms, while it has a negative effect on the entry of large firms. Interestingly, financial constraints have a larger effect than entry regulations and labor market regulations on entry and post-entry growth. We also develop a simple model to help understand our findings and their implication for productivity growth.

18. Trade as a barrier to firm creation? In an ongoing research project with Juan Carluccio and Clement Malgouyres, “Trade and firm creation”, we extend the results in the previous paper to look at how international trade affects entrepreneurship and firm creation. Surprisingly, this important issue has been underexplored both theoretically and empirically. We follow the recent literature on trade and heterogeneous firm to model firm entry and export decisions, allowing for realistic patterns of trade costs and productivity dynamics. Our model predicts that trade liberalization should have a negative impact on firm creation when we account for the timing of firms’ exports during their life cycle (younger firms tend to export less). We test and validate these predictions using French manufacturing comprehensive surveys and customs data by firm, industry and region over two decades.

D. References by publication stage

Published papers:

1. "International trade puzzles: a solution linking production factors and demand" with J. Caron and J. Markusen (*Quarterly Journal of Economics*, 2014)
10. "A measure of upstreamness of production and trade flows" with P. Antras, D. Chor and R. Hillberry (*American Economic Review*, P&P, 2012)
11. "A Coasian Model of International Production Chains" with Hillberry (*Journal of International Economics* 2018)
13. "Global sourcing under imperfect capital markets" with J. Carluccio (*Review of Economics and Statistics*, 2012)
14. Foreign entry with technological incompatibilities in the supply chain" with J. Carluccio (*Journal of International Economics*, 2012)
15. "Economic geography and wages: evidence from micro-data in Brazil" with R. Paillacar and C. Terra (*Journal of Development Economics*, 2010)
16. "Structural Gravity and Fixed Effects" (*Journal of International Economics*, 2015)
17. "Credit constraints as a barrier to the entry and post-entry growth of firms" with P. Aghion and S. Scarpetta (*Economic Policy*, 2007)

Revise & Resubmit:

2. "Per capita income and the demand for skills" with J. Caron and J. Markusen (R&R in the *Journal of International Economics*)
5. "Firm Heterogeneity in Consumption Baskets: Evidence from Home and Store Scanner Data" with B. Faber (R&R in the *Review of Economic Studies*)

Completed working papers:

4. "Per capital income, consumption patterns, and CO2 emissions", with J. Caron, under review in the *Journal of the Association of the Environmental and Resource Economists*
7. "Generalized Separability and Integrability", under review in the *Journal of Economic Theory*
8. "Gains from Trade under Generalized Separability", under review in *Economics Letters*
6. "A New Engel on the Gains from Trade", with D. Atkin, B. Faber and M. Gonzalez-Navarro
9. "On the Fragmentation of Production in the US", under revision
12. "Commodity Trade Matters", with J. Sayre, under review in the *American Economic Journal: Macroeconomics*

Work in progress described above (several other ongoing projects are not described above):

3. "Home-Market Effects on Innovation", with J. Caron and C. Fieler
18. "Trade and firm creation", with J. Carluccio and C. Malgouyres