STAR ATLAS

State of the Economy

ATMTA, Inc.
Department of Economics

Q3 2023

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Executive Summary

The quarter began with the SAGE: Escape Velocity deactivation on July 7th. Consequently, Claim Stakes became the only source by which R4 was produced. This change led to a thriving commodity market and changes in asset preferences. In particular, R4 prices increased, on average, roughly 250% from their DAO origination prices. We also saw a large increase in secondary market trade value for both Ships and Claim Stakes through the quarter.[1]

As we enter the age of the new SAGE economy, we use this Quarterly Report to provide a snapshot of the Star Atlas economy. Just as the quarter began with the deprecation of EV, it ended with the release of SAGE Labs. While this report only summarizes SAGE Labs data, early numbers are extremely promising and assure us that the next chapter of the Star Atlas Economy has begun.

Key Highlights:

- Aggregate ATLAS production in FF and FC has increased 20% over the quarter, most of which can be attributed to Claim Stakes.
- The MUD faction has risen to the top regarding wealth and economic productivity. Still, output per capita is very similar across factions.
- Wealth inequality is largest in the MUD faction and lowest in ONI
- The Star Atlas population grew by just over 11,000. Much of that is attributed to Nonresident Currency holders.
- R4 production has steadily increased over the period, and the aggregate production-to-consumption ratio of R4 has approached one over the quarter.
- With the R4 price increases, margins on Armstrong Ships and Claim Stakes are at an all-time high.
- 5,300 profiles have been created in SAGE Labs.
- Labs players have approved over 1.38 million transactions since launch.
- 18,862 golden tickets have been crafted in SAGE Labs.

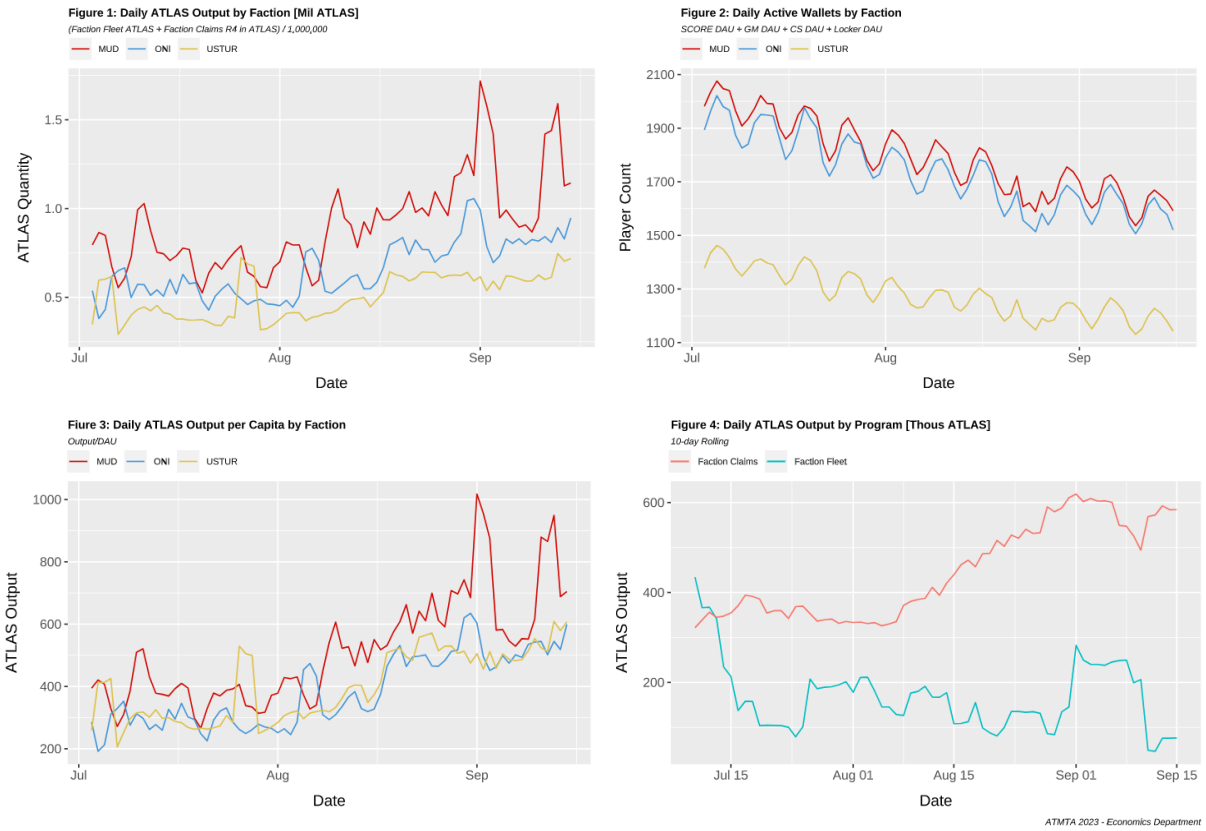
This economic quarterly sheds light on the new production economy, thriving commodity markets, and the implications on player wealth and decision-making across Star Atlas programs. The evolution of gameplay and economic systems allows us to explore the per-faction advantages and disadvantages of per-faction economic choices leading up to the launch of SAGE Labs[2]. We begin by exploring the general performance of each faction during this time.

[1] We measure the value of a good on the secondary as its current market price in our in-game cryptocurrency, ATLAS. This quarter, ship ATLAS prices rose approximately 2.7% on the secondary market with an outsized effect for smaller ships.

[2] 2023-07-01 to 2023-09-15

The Dawn of Prosperity

SAGE Labs brings with it the activation of true effort-based labor market activity. Programs such as Faction Fleet, Faction Claims, and Escape Velocity allowed players to earn in-game assets passively (or near passively). Now, players must manage their fleets to increase their yield potential strategically. Metrics from SCORE and other Star Atlas programs provide insights into each faction's possible success or failure in Labs. The following figures explore these metrics.



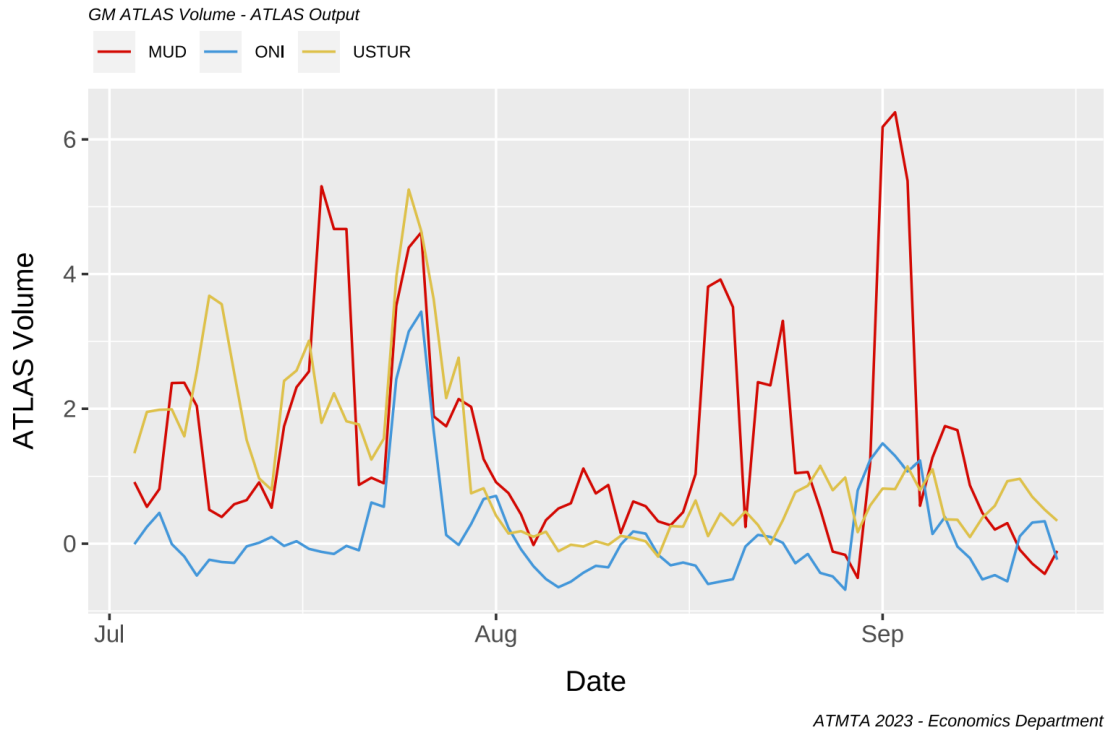
Figures 1 and 3 show that the MUD faction outperformed its contemporaries in aggregate and per capita ATLAS output throughout the quarter. Despite a roughly 20% drop in active wallets seen in Figure 2, we see a greater than 50% increase in production over the quarter.[3] An interesting note from Figures 1 through 3 is that the USTUR faction. At the same time, it has the lowest faction membership and has similar overall production to the ONI Faction, which puts its per capita productivity in line with all factions (with perhaps the exception of MUD in the last two months).

[3] Note that wallets and players are not necessarily equivalent. Wallet de-growth could partially be attributed to wallet consolidation as the R4 production economy encourages players to keep all assets in the same place. In other words, players now must transfer R4 from claim stakes to their own wallets rather than just purchasing from the DAO. Consolidation gets around this inconvenience.

The output growth seen in the above figures can be attributed mostly to the large jump in Claim Stake employment in SCORE's Faction Claims program. In Figure 4, we see that ATLAS production from Faction Claims has been steadily increasing over the quarter while that of Faction Fleet has been slightly decreasing.

Figure 5 below shows marketplace spending minus ATLAS output by faction. MUD and USTUR were responsible for most larger volume days over the quarter. Interestingly, for most days, spending in the market greatly exceeds earnings in-game. Unlike the other two factions, The ONI faction typically runs a surplus. In a later section, we discuss the implications of wealth in the Star Atlas ecosystem. Table 1 provides summary statistics for Figure 5.

Figure 5: Daily ATLAS Spending Less ATLAS Output by Faction [Mil ATLAS]



All factions exhibit similar spending habits. 3.8 percent of the trade volume in Q3 was attributed to resources (R4). These resources, previously described as output, proved to be an attractive gameplay objective for players looking to increase their engagement in the Star Atlas economy.

Table 1: Total ATLAS Spend Per Faction

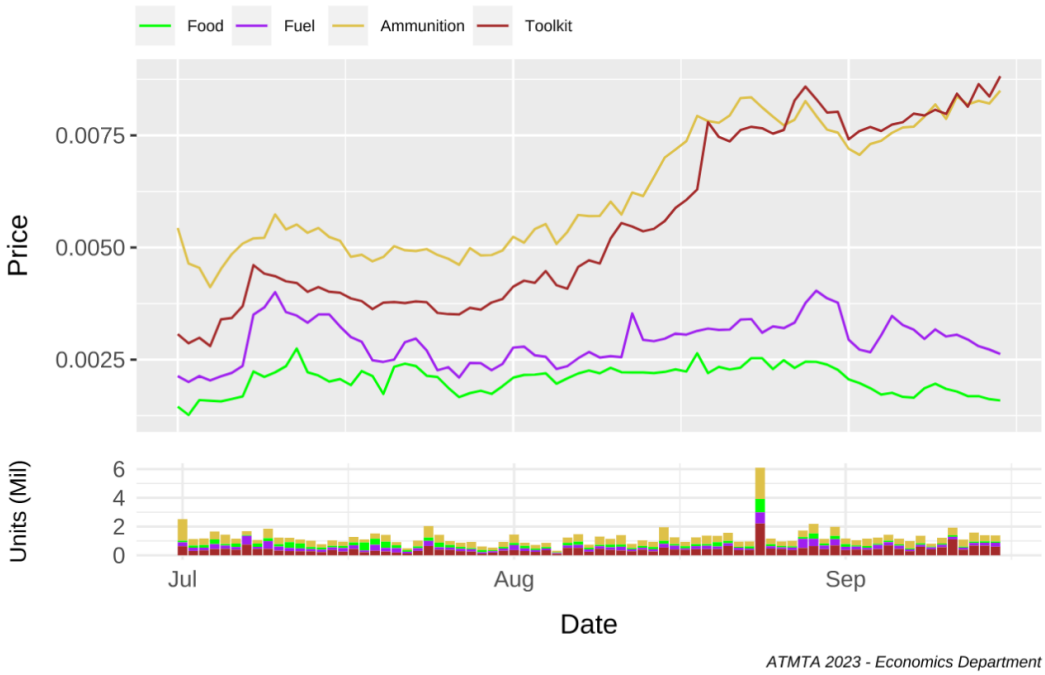
Faction	Total ATLAS	Mean ATLAS
MUD	186,235,181	2,418,638.7
ONI	61,582,775	799,776.3
USTUR	127,472,928	1,655,492.6

In SAGE Labs, new dynamics will influence spending behavior, and opportunities for large-scale wealth transfers between factions will present themselves. With this in mind, we anticipate that the most organized of the three factions will reap the most rewards, and the release of labs will change output and wealth distribution.

Commodity Prices and Volume

Figure 6 shows the average price and sell volume of R4 in ATLAS over the past quarter. This is one such aspect of the economy that SAGE Labs has impacted and will continue to impact in the SA Economy. The period ends just before the release of labs, but R4 prices have remained steady following its release.

Figure 6: Daily Commodity Price and Volume in ATLAS by Resource



The ATLAS prices of food, fuel, ammunition, and toolkits changed dramatically throughout the quarter and have been a dominant factor in wealth creation within the ecosystem. Food, Fuel, Ammunition, and Toolkits increased by 9.6%, 23.2%, 56.3%, and 187.3%, respectively. These increases allowed production-oriented players to benefit and increase their wealth within Star Atlas. Consumer-oriented players were directly impacted by their ability to maintain a presence in the Faction Fleet program. Interestingly, Toolkits and Ammo flipped exchange rates even though Ammo is used more in the economy.

Due to the increasing cost of feeding, fueling, repairing, and rearming, ships such as the Fimbul Lowbie began yielding negative ATLAS output during the quarter.[4] Consequently, we saw a decrease in the labor force for specific ships. With the release of labs, these ships have found a new economic use case.

[4] Ship yield is calculated using the AVG market price as a proxy for the cost of goods to produce ATLAS. In reality, many players in our ecosystem subsidize their R4 purchases with their production.

The Star Atlas Census

Perhaps one of the most iconic tables in previous SA QRs is the SA Census – A perfect example of a snapshot taken as we move into the next chapter of the SA Economy. Table 2 below shows that the Star Atlas ecosystem grew by 11,056 (7.09%) net wallets over the quarter, with the largest change occurring in the nonresident currency category gaining an additional 10,000 wallets. A large portion of the growth in the currency holder category is likely due to a large jump in Solflare wallets registered in Escape Velocity during the surge in activity close to the programs' termination.

Table 2: Star Atlas Census (09-15-2023)

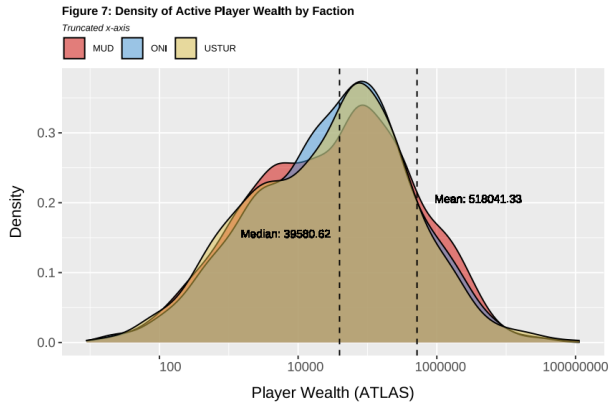
Category	Currency	NFT Owner	Voter	Employed	Freq	Frac	Wealth	WShare
Nonresident Currency	Y				97265	58.2	8.57	19.27
Nonresident NFT		Y			15642	9.4	1.08	2.42
	Y	Y			9220	5.5	0.70	1.58
Nonresident Locked POLIS	Y		Y		2507	1.5	2.78	6.26
	Y	Y	Y		659	0.4	1.22	2.75
Residents	Y	Y		Y	30120	18.0	13.07	29.41
		Y		Y	6299	3.8	2.38	5.35
Citizens	Y	Y	Y	Y	5303	3.2	14.65	32.96
Total					167015	100.0	44.45	100.00

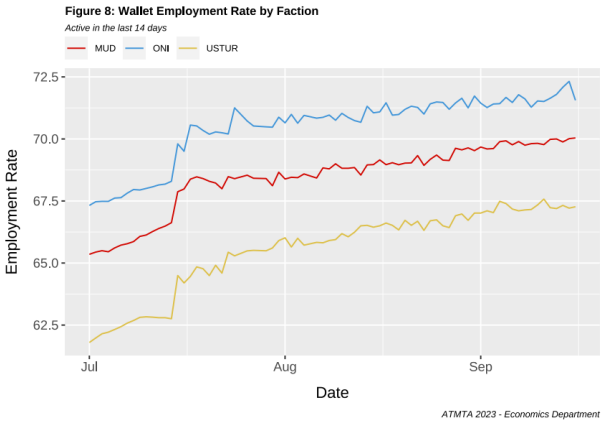
[1] Exclude wallets with <100 R4 holdings

Note the wealth share disparities between the largest census category, Nonresident Currency holders, and our most engaged players, citizens. While the latter comprise a significantly smaller fraction of the overall SA population (3.2% compared to 58.2%), they also hold a much larger share of SA wealth (32.96% compared to 19.27%, respectively). This fact emphasizes the insulated nature of the Star Atlas economy – the vast majority of the wealth is held by citizens with Star Atlas' best interest at heart, with a smaller portion of the wealth held by non-residents. That isn't to downplay the importance of having a significant share of wealth in the hands of foreign holders; they play a vital role in promoting the short-term health of the Star Atlas marketplace and economy.

Faction Wealth and Employment

To further explore the wealth distribution of Star Atlas, we plot wealth and employment by faction in Figures 7 and Figure 8 below.[5] Note well that the distribution in Figure 7, while it appears Gaussian, has a truncated x-axis.[6] Indeed, we see that the mean wealth of a player is orders of magnitude larger than the median. This is not atypical of wealth data; for example, the Pareto Rule says that, in a typical economic system, 20% of agents will account for 80% of the value – a rule that applies to the US Economy as well.[7]





In Figure 8, employment rates are upward-sloping, which may seem confusing initially compared to the decreasing population. This increase in employment rate is due to several factors. First, as the total Daily Active Wallets decreases, so does the employment rate denominator, which would increase rates. Second, Claim Stakes are now employed at higher rates within and between player accounts, as we will see later in this report. Finally, play intensity and sentiment among players could also be increasing, though we have no empirical evidence in this report to support this.

Overlaying the distributions on top of one another shows some interesting differences in wealth between factions. MUD wealth distribution is a bit fatter than the other two factions. This means more people are in the lower *and* higher wealth categories. If it were Gaussian, we would say it has a higher variance than the other two. Further, while ONI and USTUR are very similar in wealth distribution, ONI appears to have slightly more people in the "median" territory than USTUR.

[5] Employment rates are calculated by taking the quotient of per-faction wallets in Faction Claims or have been active in Faction Fleet in the past 14 days.

[6] Normally distributed

[7] The Star Atlas Pareto ratio is closer to 20:95, emphasizing the outsized wealth disparity in web3 environments compared to the real world.

Finally, using a crude metric, we rank each faction from highest (1) to lowest wealth inequality (3) and provide aggregate wealth measures in Table 3 on the next page.[8]

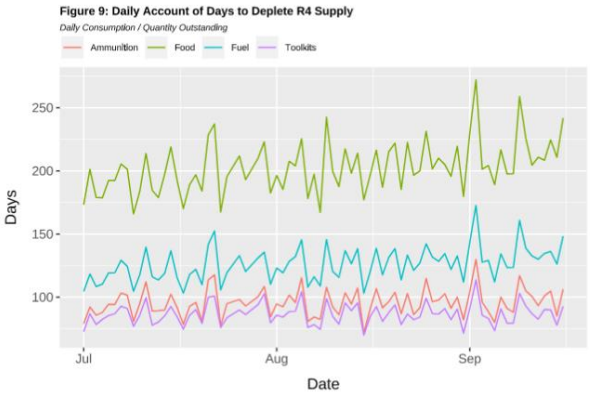
Table 3: Total ATLAS Wealth Per Faction

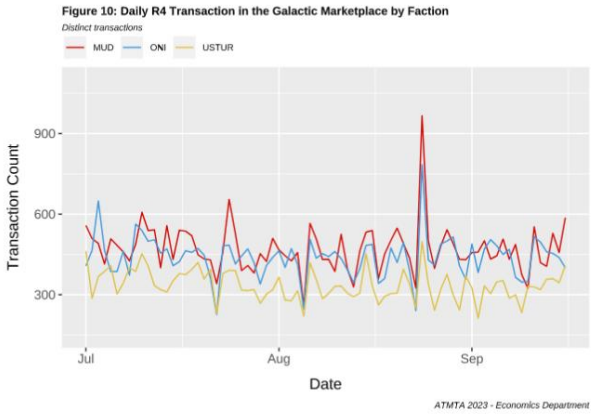
Faction	ATLAS	Wealth Inequality Rank
MUD	871,874,479	1
ONI	662,632,410	3
USTUR	685,300,214	2

The disparity in wealth does not come from a lack of economic involvement, as observed in the high employment rates. Instead, it relates to the limitations brought on by current economic constraints. For example, a player with smaller classes of ships can never outpace a player with larger class ships due to the fixed nature of Faction Fleet. However, as gameplay matures and economic opportunity evolves in programs such as SAGE Labs, so too does the nature of wealth-building within Star Atlas.

Resource Activity

The close of this quarter marks the end of the first full period of a player-run economy in Star Atlas. Despite rising R4 prices, R4 inventories have remained steady relative to daily demand in SCORE. Figure 9 illustrates a metric called days-to-deplete at approximately 150 days on average across resources. Level differences in the metric between resources are mostly due to the different rates at which resources are consumed in the economy.[9] Days-to-deplete is perhaps naive because it assumes all agents cooperate and share. In practice, we see stark differences in R4 holdings: half of wallets have large days-to-depletion, and the other half have almost no holdings.



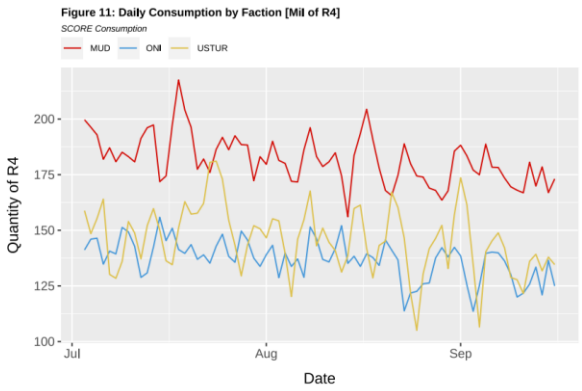


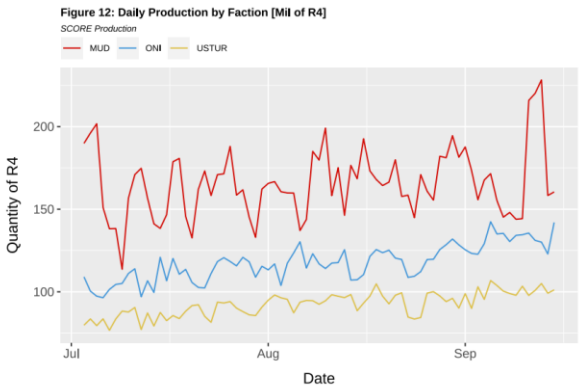
Figures 10, 11, and 12 show R4 behavior by faction. This behavior is mostly uniform between factions for Marketplace activity but differs for production and consumption. These differences, however, are largely driven by the wealth and employment disparities discussed earlier in this report. While MUD consistently outperformed the other factions, ONI and USTUR fought for dominance throughout the quarter. USTUR has the lowest production of the three factions but

[8] We estimate the first two moments, alpha and beta, of the beta distribution in order to measure wealth inequality among factions.

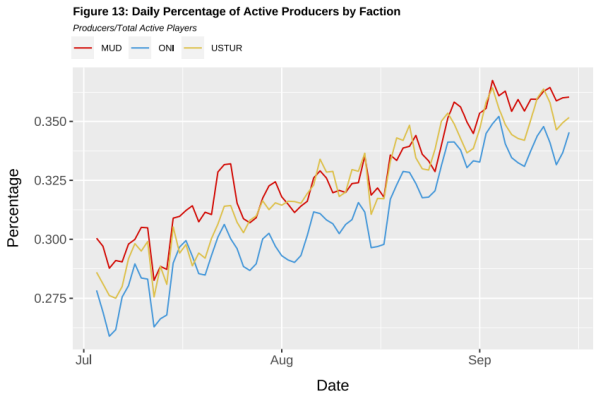
[9] Days-to-deplete is a measure that takes total R4 holdings in wallets divided by total daily R4 consumption in SCORE. This gives us the number of days, in theory, that current R4 holdings could sustain the economy.

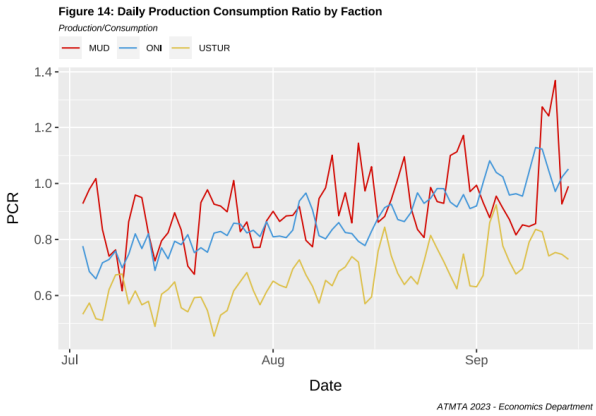
has more producers than ONI, indicating that most USTUR producers utilize lower-tier claim stakes while ONI utilizes higher tier.





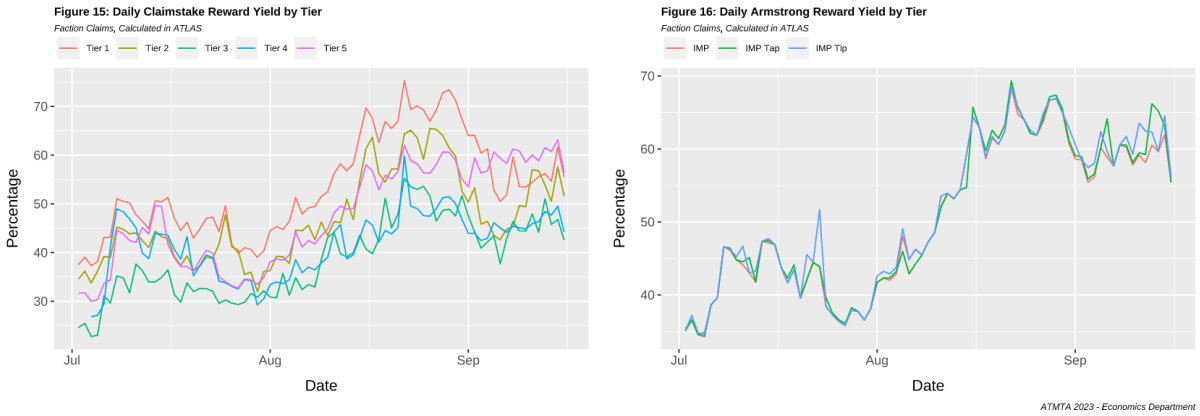
Figures 13 and 14 show each faction's daily production and consumption behaviors. With MUD producing a surplus of 140% of their R4 demand, they can sell to USTUR players who produce a deficit of 80% of their R4 demand. This means that MUD is taking full advantage of the increase in commodity prices while USTUR is forced to buy into it.





Figures 15 and 16 address the success of R4 production facilities over the quarter and emphasize why we saw such massive increases in production and prices. Due to the newly floating nature of commodities in Star Atlas, productive assets saw large swings in in-game ATLAS yield. For example, in Figure 15, we see that, on average, Claim Stakes saw an increase in ATLAS equivalent annual margins of approximately 25 percentage points.

The newly released class of Armstrong ships, the first miner ships to be released in Star Atlas, saw a similar margin increase. As we saw in Figure 14 above, these newly productive assets helped close the production-to-consumption gap of R4 in the economy.



Producers were the quarter's winners, and because of this, they were in an advantageous position for the launch of SAGE Labs and the beginning of the player crafting economy within Star Atlas. Next, we deliver preliminary statistics collected in the first several days of Labs, closing the quarter.

Destination Starbase

Typically, we commit a data freeze on the Star Atlas Quarterly Report 15 days before its release to mitigate data discrepancies and provide ample writing time. This report is an exception. SAGE Labs released on September 21st, 2023, we felt obligated to provide insight into some of the preliminary data we observed.

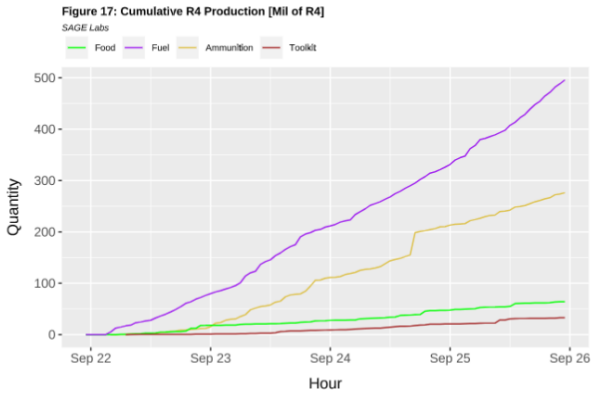
SAGE Labs is a fully-fledged economic loop with extraction, crafting, scanning, and redemption loops with randomness baked into the mix. Players may use any Star Atlas ship and crew to produce valuable assets and explore the Galia expanse. This upgrade to economic complexity also introduces a massive change to the Galactic Marketplace in that 29 new assets will now be fully traded with floating, competitive prices.[10]

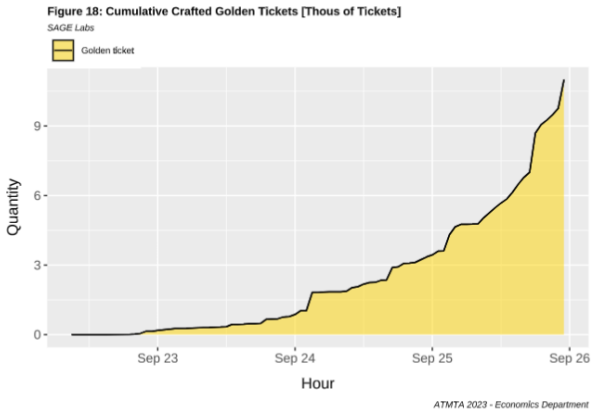
With nearly 5,300 profiles having registered in Labs and millions of assets produced, the economics team balanced and maintained the Labs economy using a slew of roughly 40 levers and hundreds of other game economy state variables. Lastly and importantly, every action in

[10] Consisting of resources, SDUs, and golden tickets

Labs is captured by the Solana blockchain in real time – a feat previously never accomplished at such scale, with 1.38 million transactions measured in the first four days.

Figures 17 and 18 illustrate the cumulative sum of R4 and Golden Ticket production since launch. Fuel has become the most popular resource to craft in Labs due to the abundance of





hydrogen in the starting zones. It is also the most consumed R4 in Labs, with about 900 MM units consumed as of the time of this writing.

Golden Ticket redemption has accelerated during the period. This acceleration is partially due to growing player numbers in SAGE, but much of it is likely a result of human capital accumulation. In other words, players gain the knowledge and skills necessary to optimize their production in SAGE, just like in a physical economy.

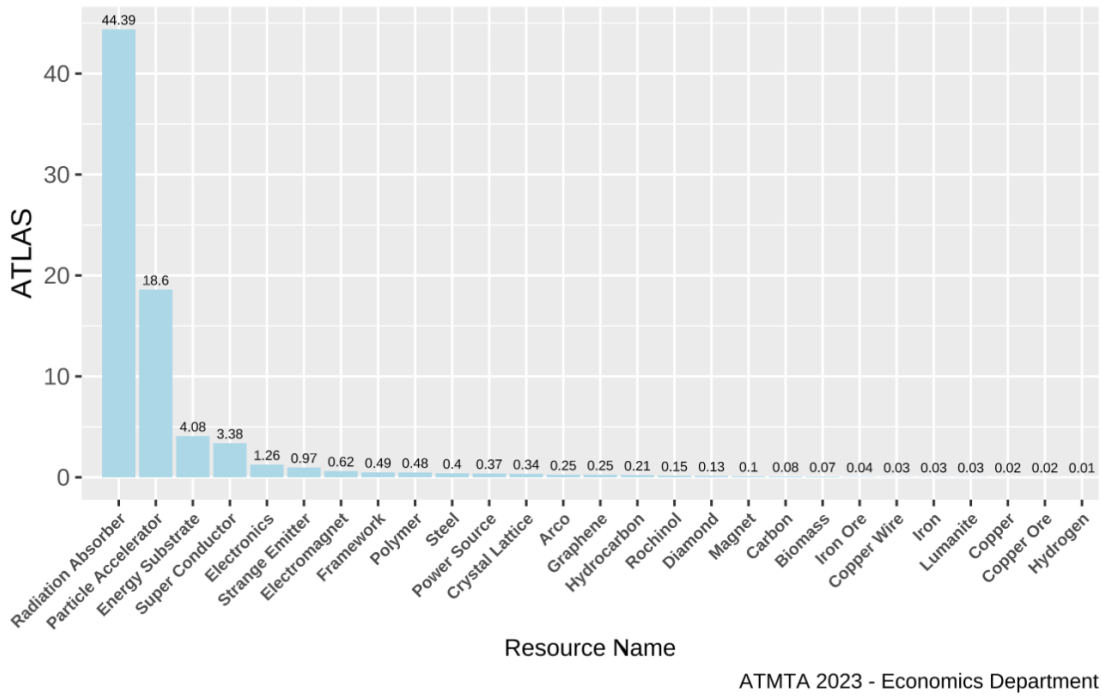
We present the current market prices of game assets in ATLAS in Figure 19. To further explore the value of labor in SAGE, we decompose the Radiation Absorber into its most basic building blocks, R9. Radiation Absorbers are composed of 11 Hydrogen, 2 Faction Crystals, and 9 Carbon. If we add up that value in ATLAS using Figure 19, we see a “Decomposition Value” of

1.18 ATLAS.[11] The market value of Radiation Absorbers is nearly 40 times that of its decomposed value.

This decomposition emphasizes the value of time in SAGE. Players must combine those basic building blocks using multiple recipes and transport resources to achieve the final good. The labor market in SAGE is very much alive, and specialization will play a vital role in a player's

Figure 19: Average ATLAS Price Per Material [2023-09-25]

Sage Labs



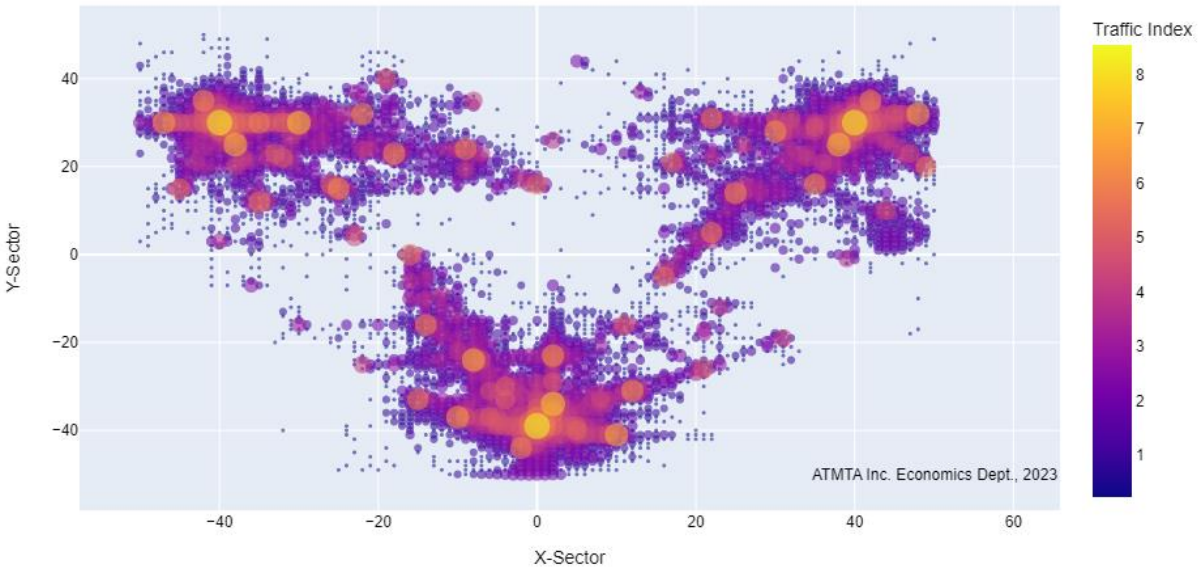
ability to take advantage of opportunities in the future.

Finally, in this report, Figure 20 shows a heat map of the Galia Expanse, Star Atlas' universe. It plots the traffic density index of each sector on the map. Bigger yellow dots represent high-traffic areas, and smaller blue dots represent lower-traffic areas. It's no surprise that we see significant activity at the CSSs as well as the major mining spots.[12] We also see, however, considerable traffic in regions between these sectors. This activity is due both to random

[11] We use the AVG value of a faction crystal and sum up the quantity required by market price of each building block to get the decomposition price.

[12] Central Space Stations are the only locations in-game where asset redemption can take place.

Figure 20: Traffic Heatmap
Sage Labs



exploration players might be engaged in to learn more about the lore of Star Atlas as well as smaller fleets making multiple warp jumps to their final destinations.[13]

Conclusion

The events that took place over this quarter represent the origin of the Star Atlas player economy. Thriving commodity markets coupled with increased production leading up to the release of SAGE Labs illustrated the wealth discrepancy between factions and the benefits that those on top were able to reap. The population of producers increased as a result, along with the yield of productive assets.

The post-period that captured the first four days of SAGE Labs activity showcased the high demand for R4, specifically fuel, as players worked to stockpile their ships with adequate supplies. Golden ticket production went parabolic as players began recognizing the value of golden ticket crafting. While not mentioned above, ship crafting was less of a priority for players as only 3 Fimbul Airbikes, 2 Calico Maxhog, and 1 VZUS Solos were redeemed during the period.

We hope this report has provided a deeper look into the Star Atlas economy as well as built anticipation and excitement for the months and years to come. SAGE: Labs, one of the most sophisticated economic systems on Solana, has brought a new paradigm – the age of real-world, online economies.

[13] Players can explore the lore of star atlas by traveling to a sector and clicking the “Lore” button to open up a dialogue box describing the story of that location.